MUNICIPAL ENGINEERING

The World's Leading Municipal Publication

VOL. XLIX. OCTOBER, 1915. No. 4.

EDITORIAL

PROPOSED NEW YORK CONSTITUTION

As usual, the result of the New York Constitutional Convention is a compromise, this time between the forces which desired to concentrate responsibility in a single head, the governor, and those which desired to continue as nearly as possible the present vast diffusion of responsibility, especially for expenditures, that the present possibilities for dissipation of funds in channels "where they will do the most good" might be continued.

The ballot is shortened and the number of state officers to be elected is reduced to about three, so that there is some possibility of the selection of administrative officials for their fitness for their work, but appointees must, many of them, be approved by the legislative body, so that the demands of local politicians must still be met if the ship of state is to move forward.

Insufficient provision is made for continuance of efficient employes in subordinate positions without reference to political service of themselves or their sponsors, an important part of the plan for making the governor responsible for the efficiency of his administration, since it relieves him of the necessity of removing men from their positions simply because political assistants of his own desire the places for themselves or their friends and relatives.

A notable advance in the right direction has been made, however, which may possibly be more acceptable to the voters, who must pass upon the work of the convention, than a more radical document would be.

FIRE LOSSES AS AFFECTED BY MOTOR-DRIVEN EQUIPMENT

In connection with the statistical facts obtained from fire chiefs thruout the United States and published in the September and October issues of MUNICIPAL ENGINEERING many cities have supplied us with facts relating to fire losses.

In a number of cases these records cover a period of years. A careful examination has been made of the records of more than one hundred cities which have, within the past five years, either added motor-driven equipment to their fire departments or completely motorized their fire departments. This study indicates that, in proportion to the population, those cities which have equipped with motor fire apparatus have reduced their fire losses on the average nearly 12 per cent. and in only a few relatively unimportant cases has there been an increase in fire losses subsequent to the installation of motor equipment.

The saving in fire losses each year is many times greater than the amount necessary to install and maintain motor-driven equipment. The reasons for this reduction in fire losses in cities equipped with motor apparatus are obvious. Motor-driven equipment possesses the advantage of speed, both in traveling and in manipulation. A gasoline pumper, for instance, can not only travel a given distance in a less space of time than a horse-drawn steam pumper but it can, after arrival, get a stream of water playing on the fire much more quickly than the steam engine.

The record is significant. It demands the attention of every fire committee and every fire engineer in the country. The best available fire protection is due the taxpayer and it is the fire committee's business to see that he gets it.

WHO READS MUNICIPAL REPORTS?

The Philadelphia Director of Public Works proposes to change the usual answer to this question, and his report for 1914, just received, is entitled "Plain Talk," and he gives a readable general story of the things of interest in his department, mainly in the way of comparisons to show improvements over old methods. It is illustrated largely with reproductions of cartoons and pictures which are the result of a competition among employes of the various bureaus, who were induced by prizes to show in this manner their ideas of the most prominent and valuable improvements in administrative methods coming to their knowledge.

The result is a book which can possibly not claim to be attractive, but strikes the eye and will thus obtain notice. If one begins to read he is likely to continue, and thus the object of the author is attained. Special methods of attracting attention are the form of the list of contents on the cover and the address to the reader on the first page.

The report of the Bureau of Highways in the department uses the same methods of calling attention to the points of interest in the book containing it, and opens with a page of "things to remember," which are somewhat more detailed than the salient facts displayed on the cover. This report is written in very readable style, and does not follow any artificial rules of content or arrangement, but is logical in arrangement and statement.

One of the reasons for publishing a municipal report should be to tell the citizens what the city is doing for them in language which they can understand. It is seldom that any attention is paid to this object and it is commendable that these reports are emphasizing it. Another is to make the statistics of city work complete and accurate and publish them in such form that they can be used in comparisons, as models, and as sources of real information, and this the Chief of the Bureau of Highways has done in addition to making his report readable.

MOTOR TRUCK OPERATION AND ACCOUNTING II.

By Charles A. Dickens.

EVEN when there is nothing to haul, a motor truck is $3.34 per day cheaper to own than the number of horses and wagons required to do the same amount of work.

The above statement is amply proven by the following comparison of fixed charges on each type of equipment and is substantiated by Mr. James E. Baird, of the General Motors Truck Company, as follows:

FIXED CHARGES ON FIVE HORSES AND TWO HORSE-DRAWN TRUCKS.

(Equipment needed to do the equivalent work of one 3½-ton gas truck.)

	Per day.	Total.
Depreciation.		
On 5 horses valued at $200 each, at 20 per cent. per year, equals $200	$0.67	
On 2 wagons valued at $250 each, at 10 per cent. per year, equals $50	.17	
On 2 sets double harness valued at $75 per set, at 20 per cent. per year, equals $30	.10	
Interest.		
At 6 per cent. on horse investment of $1,000, depreciating 20 per cent. per year, equals $180 for 5 years, or an average of $36 for one year.	.12	
At 6 per cent. on wagon investment of $500, depreciating 10 per cent. per year, equals $165 for 10 years, or an average of $16.50 for one year	.06	
At 6 per cent. on harness investment of $150, depreciating 20 per cent. per year, equals $27 for 5 years, or an average of $5.40 for one year..	.02	
Insurance.		
Fire, at 1 per cent. per year on total investment of $1,650.00 equals $16.50 per year	.06	
Rent.		
At 3½c per square foot per month for 860 square feet equals $30.10 per month	1.20	
Feed.		
For 5 horses at 60c per day each	3.00	
Labor.		
Feeding horses and cleaning stable at least 2 hours per day, at 20c per hour	.40	
Cost of keeping 5 horses and 2 trucks idle.		$5.80

FIXED CHARGES OF ONE GMC 3½ TON GASOLINE TRUCK.

	Per day.	Total.
Depreciation.		
On truck valuation $2,040.61 (chassis $2,500.00 less tires, $459.39) at 20 per cent. per year equals $408.12	$1.36	
Interest.		
At 6 per cent. on investment of $2,500.00 depreciating $408.12 per year, equals $505.13 for 5 years, or an average of $101.03 for one year...	.34	
Insurance.		
Fire and Collision, at 3½ per cent. per year on full valuation of $2,500.00 equals $87.50 for one year	.29	
Liability at flat rate of $35.00 per year	.12	
Property damage at flat rate of $14.00 per year..	.05	
Rent.		
At 3½c per square foot per month for 200 square feet equals $7.50 per month	.30	
Cost of keeping one 3½ ton gasoline truck idle	2.46	
Saving in favor of motor truck.....		$3.34

FIGURING AVERAGE TRUCK TON-MILE COSTS.

The following table covering one year and submitted by F. N. DuBois & Co., New York, shows operating costs of three 3½-ton G. M. C. trucks. It will be noted that one of the trucks was in service 279 days, the other 293 days, and the third 294 days. Summing it all up the three trucks covered a total distance of 22,522 miles, a tonnage of 4,789.569 tons at an average cost per truck per day of $9.96. The average per truck per ton mile was 13.89c.:

January 1 to December 31, 1914.

Truck No. 1—Geo. Clarke, Chauffeur.

Truck in service 279 days.

Covered	7, 836 miles
Averaging	28 miles per day
Handled	1,572.336 tons of material
At a total cost of	$2,760.98
Average cost per day	9.93
Average cost per mile	.35.23
Average cost per ton mile	.12.45

Truck No. 2—P. J. Reynolds, Chauffeur.

Truck in service 293 days.

Covered	7,297 miles
Averaging	24⅞ miles per day
Handled	1,508.073 tons of material
At a total cost of	$2,859.64
Average cost per day	9.76
Average cost per mile	.39.18
Average cost per ton mile	.15.25

Truck No. 3—Geo. Knecht, Cheuffeur.

Truck in service 294 days.

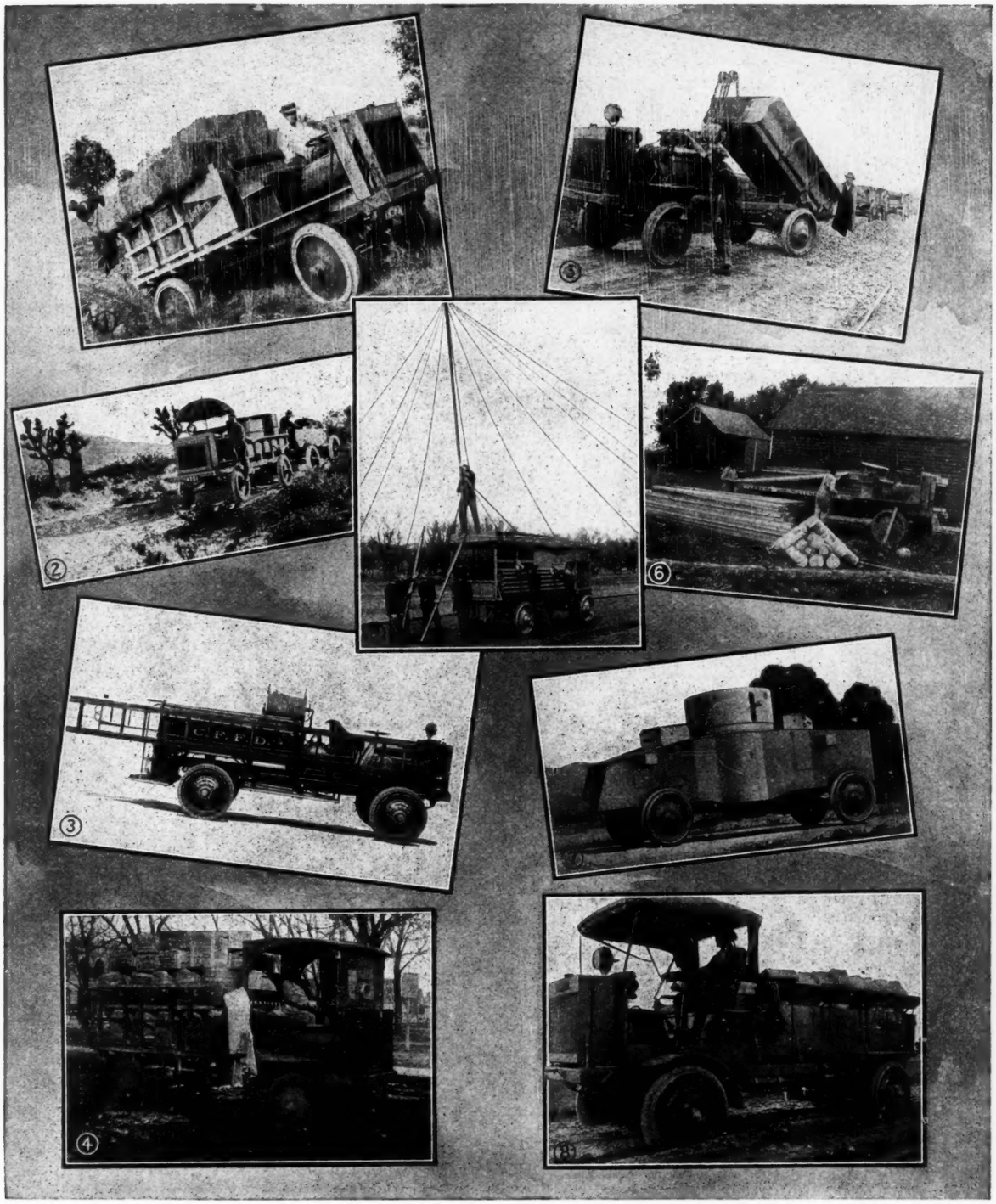
Covered	7,389 miles
Averaging	25 1-10 miles per day
Handled	1,709.160 tons of material
At a total cost of	$2,999.36
Average cost per day	10.20
Average Cost per mile	.40.61
Average cost per ton mile	.13.96

Figures Include Following Charges:

Insurance on trucks and garage, rent, taxes, depreciation, oil, gasoline, wages, and all repairs and tire replacements, and on truck No. 1 a new body, and on truck No. 3 a new set of cylinders. This statement covers one year, showing for the three trucks.

A total distance covered of	22,522 miles
A total tonnage of	4,789.569 tons
At a total cost of	$8,620.48
The average cost per truck per day	9.96
The average cost per truck per mile	.38.34
The average cost per truck per ton mile	.13.89

F. N. DU BOIS & CO.,
(Signed) Per F. W. Bauvelt.



VARIED USES OF JEFFERY QUAD

Fig. 1—Passing thru a three-foot ditch with water in bottom.

Fig. 2—Carrying as well as pulling heavy load over mountain roads.

Fig. 3—Equipped with hose and chemical fire apparatus.

Fig. 4—Fording muddy roads at Highland, Ill.

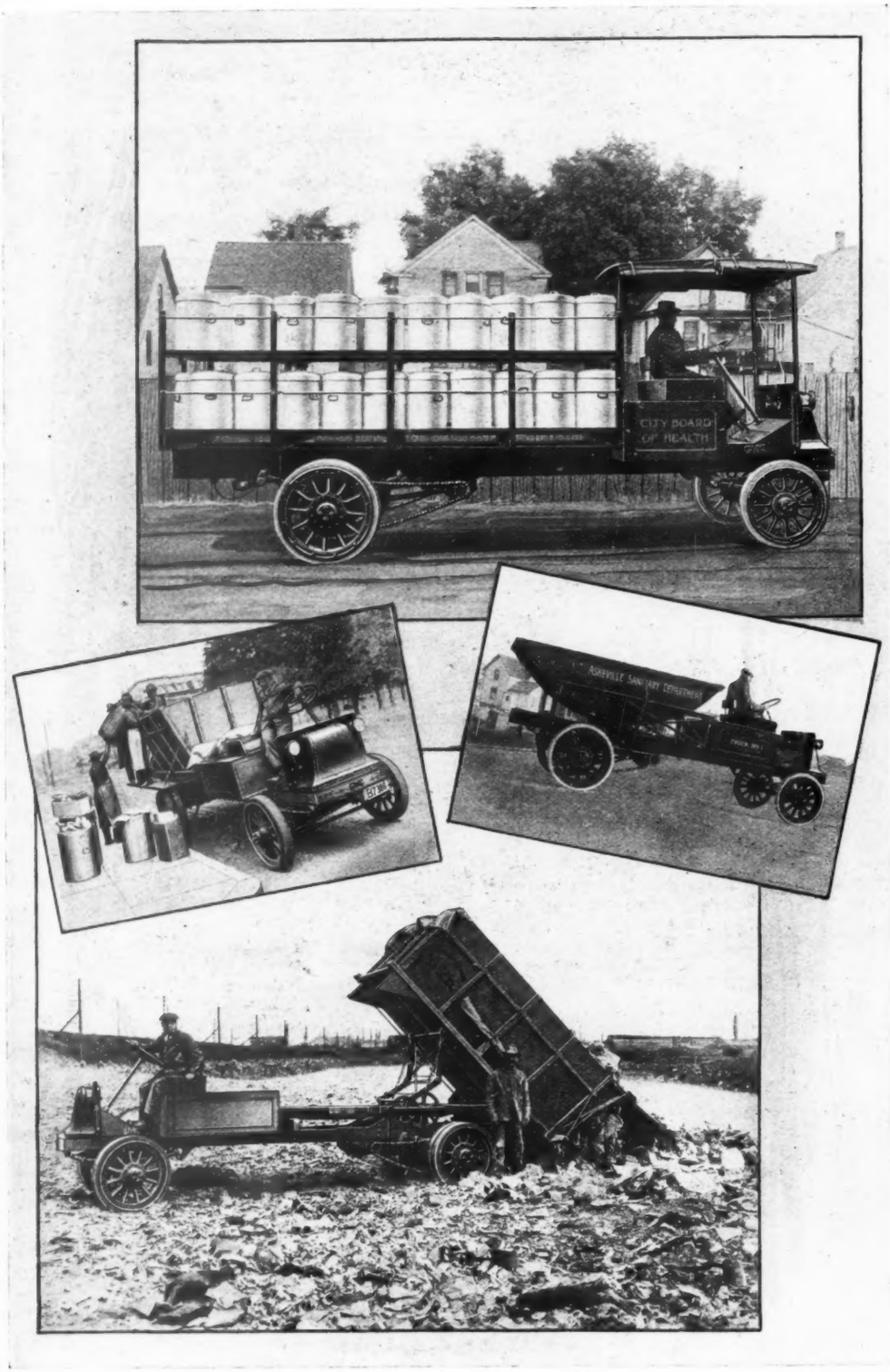
Fig. 5—Equipped with dump bodies for road construction.

Fig. 6—Equipped with special body for hauling long timbers.

Fig. 7—Equipped with revolving turret for quick-firing guns.

Fig. 8—Used by Quartermaster Corps of United States Army.

Fig. 9—Equipped with wireless telegraph station equipment.



G. M. C. TRUCKS FOR GARBAGE DISPOSAL. *The illustration at top marked "City Board of Health" shows a 2-ton G. M. C. electric truck used by the city of Miami, Fla., in house-to-house collection of wet garbage. This truck starts out from the disposal plant with 50 empty cans on the upper deck, and as a used can is collected from a residence it is loaded on to the lower deck and an empty can left in its place. In this way the load is gradually changed from 50 empty cans on the upper deck to 50 used cans on the lower deck and the truck then returns to the disposal plant where it leaves the full cans and starts out on its second trip with a fresh load of 50 empty cans on the upper deck.*

The circular-bottom G. M. C. dump truck is operated by the city of Asheville, N. C., for the removal of wet garbage.

Illustrations at bottom and left of page show a 5-ton G. M. C. electric truck, which is one of two used by the Public Works Department of the city of Boston, Mass., in the collection and removal of ashes and rubbish. View at left shows the method of loading the truck and photograph at bottom shows the truck with its body in an elevated position dumping its load from the rear. The body is elevated by a hand hoist.

ONE MILE OF ROAD EVERY FOUR DAYS.

When the commissioners of Chatham county, Ga., used mule teams it required anywhere from four to six weeks to build one mile of permanent road. Now, with their broad-tread good-roads truck and roller-bearing trailers, they build a mile in four days with a tremendous saving to the county. Fifteen-mule teams and a large percentage of the drivers have been eliminated. "We gave our five-ton capacity White good-roads truck a very severe test of sixty days," said Commissioner Harvey Granger, "and found it could go anywhere a team could go. We have also purchased ten Troy trailers with roller bearings, which trail perfectly behind the truck and which enable us to go down the road with five trailers of three yards capacity each, which means, on a basis of 3,000 pounds to the yard, that we are carrying 45,000 pounds of material direct to the road work on every trip. We believe that even if

no trailers were used, this tractor, with its five tons capacity, would do more than eight to ten teams on the same work. Commissioners and contractors would be in a position to keep more accurate and detailed accomplishment records of motor truck operation were they in possession of authentic data on weights and volumes of heavy material in bulk.

Before purchasing their good-roads truck, the Chatham county commissioners conducted a test of 45 days' duration, hauling Augusta gravel, which weighs 2,700 pounds per cubic yard, a distance of 1,115 miles. The truck was tested for 411 hours, and it moved 4,023 tons. This tonnage was handled at the rate of 89.4 tons a day.

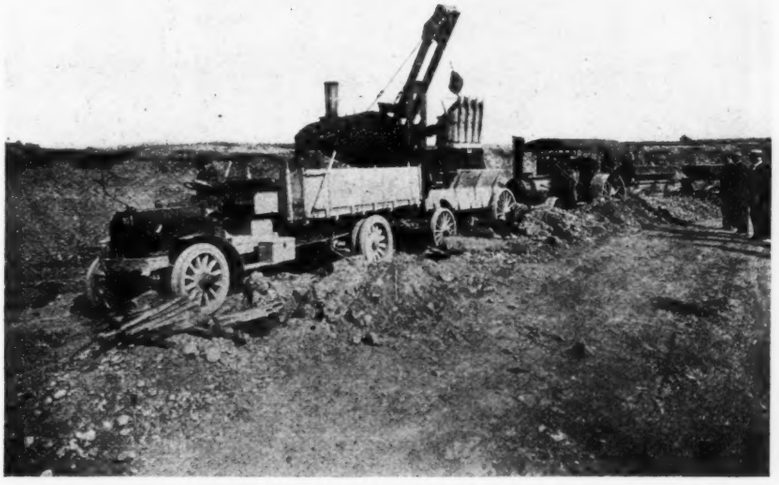
Total number of tons	4,023.0
Total number of miles	1,662.5
Miles per gallon of gasoline	1.5
Miles per gallon of oil	23.0
Total cost of operation	$459.52
Cost per ton	.112
Cost per ton-mile	.10
Cost per yard	.1542
Cost per yard-mile	.134

GRAVEL AT 7½ CENTS PER YARD-MILE.

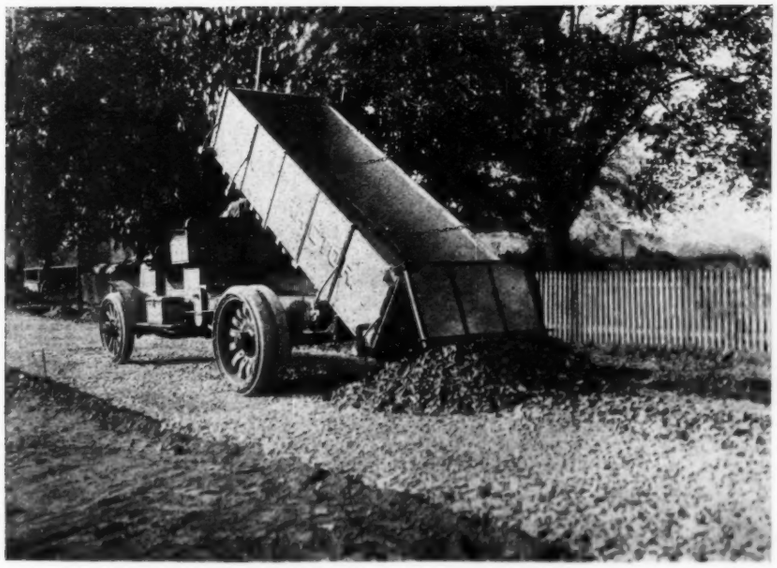
A simple comparison of the work of a good-roads truck and a string of mules is found in the Coahoma county (Miss.) record of material hauled in one month:

24-36 mules hauled 682 yards; cost	$819.00
White truck hauled 798 yards; cost	272.00

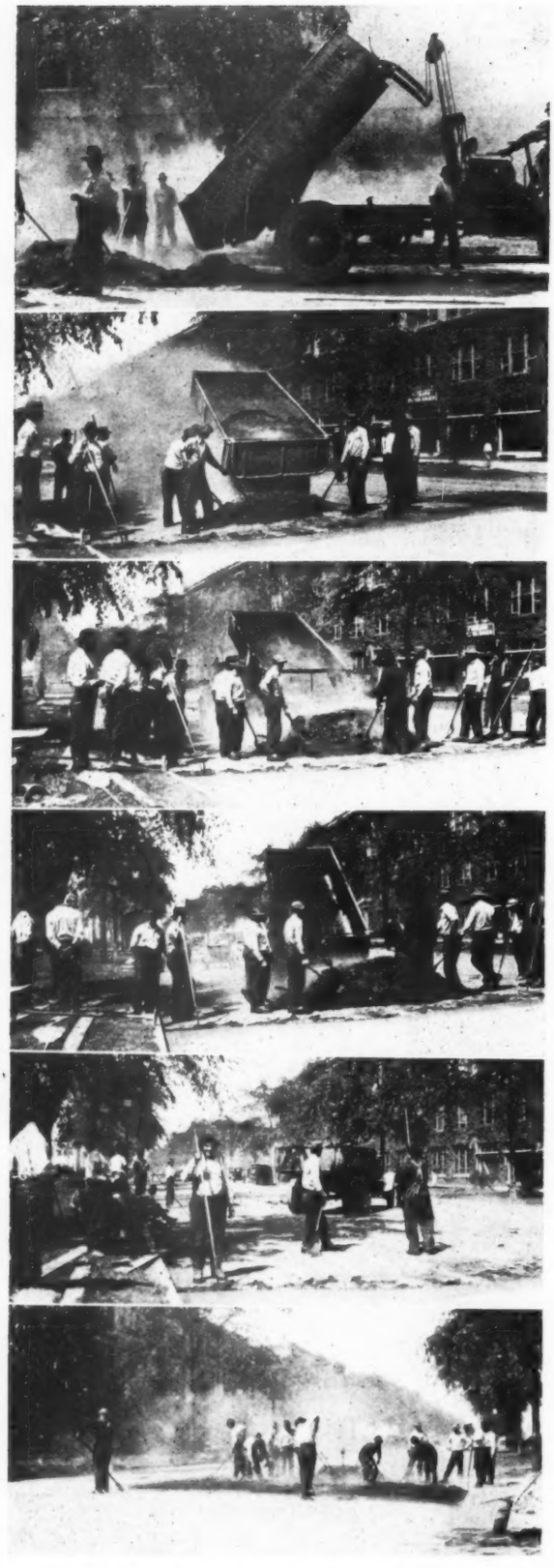
"Within the month of September," states Road Superintendent Cook, "I hauled and put down on the public road 37 cars of gravel, averaging 40 cubic yards per car. The haul was between the four and five-mile post from the station. For this, the county hired teams to haul 2½ cubic yards of gravel per load at $3.00 per load. The teams, consisting of four to six mules to each wagon, hauled 273 loads, or 682 yards, at a cost of $819. The White truck hauled 798 yards at a cost of $272, including driver's salary, gasoline, oil and upkeep. This is the cost of hauling only. This does not constitute a full month's work, but it was done within that time." The following statement covers the hauling of 32,067 yard-miles in the period from June 12, 1913, to May 9, 1914:



PEERLESS 4-TON TRUCK (*road building*). *Operated by the Dale Engineering Co., Utica, N. Y. Equipped with side dumping body and hauling 5-ton bottom dump trailer. Placed in competition with steam traction engine, hauling three 5-ton bottom dump trailers for the delivering of gravel from the pits to the road work, distance of about six and one-half miles, round trip. The truck delivered over ninety tons of gravel to the road builders every day as against twenty-six for the traction engine.*



PEERLESS 5-TON TRUCK (*road building*). *Operated by James F. Nolen (contractor), Germantown, Pa. This truck hauls total of nine wagons formerly used—98 tons per day, climbing 21 per cent. grades with capacity loads.*



FIVE-TON PACKARD *dump truck in paving service of Board of Public Works, Detroit, Mich. This truck hauls twice as much as a team and in one-fifth the time. On some jobs the length of haul from mixing plants is six miles.*

From Dickerson's Switch:			
5,052.5 yards	4¾	miles	23,999.4 yard-miles
From Sessions Switch:			
4,531 yards	1	mile	4,531.0 yard-miles
From Old Mill Switch:			
3,537 yards	1	mile	3,537.0 yard-miles
Total amount hauled			32,067.4 yard-miles
Total cost			$2,322.52
Cost per yard-mile			.057

In the construction of this road the entire subgrade was plowed soft. With a full load, the truck was run over the subgrade four times and the broad steel wheels rolled the subgrade until it was smooth. Then the gravel was dumped and spread, beginning at the point nearest to the gravel car. As the loads are hauled to the progressive dumping points the fully loaded truck, driving over gravel that has already been dumped and spread, packs it down thoroly. Thus, as the dumping point progresses, the final rolling is done simultaneously.

Under somewhat different conditions prevailing in Nuxobee county, Miss., the prevailing cost of gravel hauling in road work has been $1.70 per ton, when the haul has not exceeded six miles. On this basis a recent job of hauling 448 tons from gravel cars at Brooksville to a road job six miles distant, would have cost the county $762.60 and the work would have been extended over a long period. Instead of using mules, however, the board of supervisors used a 5-ton truck and the work was done in ten days with a saving of $527.53, as follows:

Total Earnings: 448.65 tons, at $1.70 per ton (contract price)		$762.70
Total Operating Expense:		
376 gallons of gasoline, at 19c	$71.44	
36½ gallons of oil	13.86	
Grease	2.70	
Total for fuel	$88.00	
Negro labor, at $1.50-$1.75	84.67	
Driver	62.50	$235.17
Gross Profit		$527.53

To the further advantage of the motor truck it should be pointed out that the item of wages for the driver was $62.50.

FIGURES DEPRECIATION AT 33 1-3 PER CENT.

In the following statement of motor truck costs, covering the operation of seven Garford 3½-ton tractors with semi-trailer bodies furnished by Mr. John C. Sheridan, of The Cranford Company, contractors, New York city, it will be noted that depreciation is figured on both tractors and trailers at 33 1-3 per cent.; this statement covers a period of nine months during which period cars lost 183 car days due to repairs, and 380 car days due to being idle, of which 178 car days was previous to the beginning and after the ending of the season's work:

Fixed Charges.	Average Cost (cts.) per Mile.	Average Cost (cts.) per Ton.	Average Cost (cts.) Ton Mile.
Insurance (liab., etc.)	$0.0144	$0.0191	$0.0042
Interest (5%)	.0174	.0229	.0053
Depreciation, tractors (33 1-3%)	.0877	.1162	.0265
Depreciation, trailers (33 1-3%)	.0367	.0486	.0107
Total	$0.1562	$0.2068	$0.0467

Operating Charges.			
Drivers ($18.00 per week)...	.0616	.0815	.0184
Tires (actual)	.0385	.0512	.0116
Gasoline	.0552	.0731	.0166
Oil and grease	.0125	.0164	.0037
Expense (miscellaneous)....	.0041	.0054	.0012
Total $0.1719		$0.2276	$0.0515
Maintenance Charges.			
Tractors—			
Replacement, labor $0.0316		$0.0419	$0.0095
Replacement, parts	.0058	.0078	.0018
Accessories, labor	.0073	.0096	.0022
Accessories, various	.0126	.0165	.0037
Overhauling and painting.	.0240	.0318	.0072
Total $0.0813		$0.1076	$0.0244
Trailers—			
Repairs, labor	.0150	.0199	.0046
Repairs, material	.0050	.0067	.0015
Painting	.0032	.0042	.0009
Total $0.0232		$0.0308	$0.0070
Grand total $0.4326		$0.5728	$0.1296

Cars were operated (car days)..... 1,081
Cars covered (miles)..... 58,400
Cars carried (tons)..... 44,095
Total (ton miles).....194,919

2 cars received Feb. 25..... 526 car days to Dec. 31, 1913
1 car received April 25..... 211 car days to Dec. 31, 1913
4 cars received April 30..... 828 car days to Dec. 31, 1913

Total .....1,565 car days

		Consumption.		Average Mileage.	
Month.	Mileage.	Gals. Gasoline.	Qts. Oil.	Per Gal. Gasoline.	Per Qt. Oil.
January		.....	....	...	...
February		.....	....	...	...
March		.....	....	...	...
April	900	228	53	3.95	16.8
May	4,860	1,096	272	4.4	17.9
June	5,550	1,578	450	3.5	12.3
July	9,106	2,375	757	3.8	12.0
August 12,142		3,241	950	3.7	12.8
September ..11,108		3,002	804	3.4	13.8
October	3,471	1,082	285	3.2	12.2
November ...	6,722	1,939	560	3.5	12.5
December ...	3,559	907	221	3.9	16.1
Totals ...57,418		15,448	4,352	3.7	13.2

SPEEDING UP CONSTRUCTION WORK.

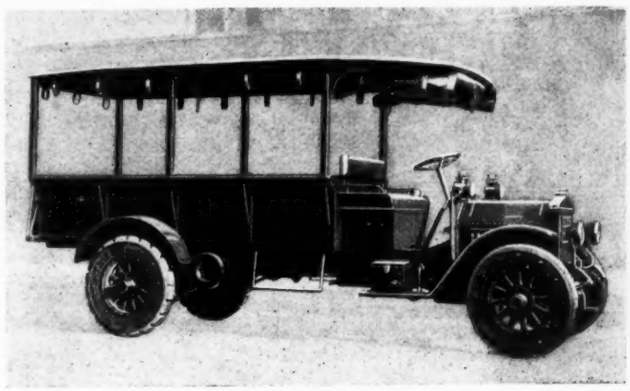
In Guilford county, North Carolina, a stretch of 2½ miles of clay road was built in a few hours. Captain G. W. Hiatt, assistant superintendent of roads, said that he found the motor truck the equal to the traction engines now in use in the county and the motor truck operates with much less fuel. "It will easily handle a five-ton load on the truck, with three five-ton trailers hitched behind, and go over any of our roads," said Mr. Hiatt. "We built 2½ miles of road, from newly-made road to a smooth-finished one, complete, in seven hours. After the truck had passed over the road eight times it left the road in as good shape as by the old method of rolling with a steam roller."

The road referred to by Captain Hiatt, from the extension of Asheboro street to Ashe street, in Greensboro, was full of stumps, rocks and deep side ditches. Eight round trips, or a

KISSEL *six-ton dump truck (road building), Missoula county, Montana.*

KISSEL *six-ton dump truck (road building), Missoula county, Montana.*

FEDERAL *two-ton truck (Department of Parks), boro of Brooklyn, N. Y.*



FEDERAL *two-ton truck (Department of Fire), Detroit, Mich.*

total of 40 miles, were covered in seven hours with a standard grader, and the road was brought to a finished state.

A Peerless five-ton truck operated by James F. Nolan, contractor, Germantown, Pa., is saving about $50 a day under the cost of doing the same work with horses. On a road-construction job this contractor employed nine two-horse wagons to haul crushed rock. A 21 per cent. grade on the haul made it necessary to keep the driver and five extra horses to tow the loads up the grade. When the wagons were unloaded it required the services of four laborers with shovels to spread the material. The truck now hauls as much as the nine wagons—98 tons per day, climbing the 21 per cent. grade with capacity loads. By driving the truck slowly while the dumping mechanism is worked, the truck spreads the material on the roads. The contractor, therefore, has disposed of 12 wagons, 24 horses, 11 drivers, and, in addition, one driver and five horses on the steep grade. He also did away with the four laborers who formerly spread the material.

The Brooks Sand and Gravel Company, of Kent, Ohio, loads a similar truck at the gravel pits with a steam shovel. The truck travels over a mile of very ordinary country roads to a dam which is being built over the Cuyahoga river for the city of Akron water works. It climbs an 18 per cent. incline to an unloading platform and dumps into a hopper, from which the material is automatically carried to the concrete mixers by a belt conveyor. The truck hauls 85 tons in nine hours and is operated at night with similar efficiency. By truck the work costs $16 a day; if done by the nine horse teams the truck replaced, it would cost $56.

The Samuel Austin & Sons Company, of Cleveland, use a Peerless five-ton dump truck with trailers to carry bricks, sand, cement, gravel and other materials to building operations a mile away at the top of a steep ascent. Two trailers are used, each carrying two and a half tons. Extra trailers are in readiness so that they can be loaded while the trucks are away. These trailers are the horse wagons formerly in use. The truck moves seventy tons a day.

WEIGHTS AND VOLUMES OF HEAVY MATERIALS.

The following table contains useful data on weights and volumes of heavy material in bulk for motor truck operators:

Material.	Weight in lbs. of 1 cubic yard.	Number of cubic yards of given material to weigh 1 ton.	1½ tons.	2 tons.	3 tons.	4 tons.	5 tons.
Ash, clinkers and cinders (mixed	1,700	1.18	1.76	2.35	3.53	4.70	5.88
Asphalt	2,349	0.85	1.27	1.70	2.55	3.40	4.25
Brick (hard)	3,375	0.59	0.88	1.18	1.77	2.36	2.95
Brick (pressed)	3,650	0.55	0.82	1.09	1.64	2.18	2.73
Cement (Rosendale)	1,620	1.23	1.85	2.47	3.70	4.94	6.17
Cement (Portland)	2,100	0.95	1.43	1.90	2.86	3.80	4.76
Clay	3,200	0.63	0.94	1.25	1.88	2.50	3.12
Earth (in bank)	3,000	0.67	1.00	1.33	2.00	2.66	3.33
Earth (dry)	2,150	0.93	1.39	1.86	2.79	3.72	4.65
Earth (loose)	2,000	1.00	1.50	2.00	3.00	4.00	5.00
Mud (soft plowing)	2,900	0.71	1.06	1.41	2.12	2.82	3.53
Pitch	1,950	1.03	1.54	2.05	3.08	4.10	5.13
Quartz (broken)	2,700	0.74	1.11	1.48	2.22	2.96	3.70
Sand (dry)	2,160	0.93	1.39	1.85	2.78	3.70	4.63
Sand (very wet)	3,200	0.63	0.94	1.25	1.88	2.50	3.12
Trap rock	4,600	0.44	0.65	0.87	1.31	1.74	2.17
Gravel (in bank)	3,000	0.67	1.00	1.33	2.00	2.66	3.33
Gravel (dry)	2,000	1.00	1.50	2.00	3.00	4.00	5.00

GARFORDS ON SUBWAY WORK.

The Richard Carvel Co. (Inc.), contractors, were the most extensive users of motor trucks on recent New York subway extension work along the Southern boulevard and 138th street. The following average schedule of Garford trucks for half-mile dirt (hand loaded) hauls is interesting in view of the fact that the hauling was up grade:

Garford trucks. Hauling done up grade.

Loading	20 minutes
Hauling	14 minutes round trip
Unloading	6 minutes
	40 minutes for each 3-ton load, or 45 tons per days of 10 hours.

Cost of Loading, Hauling and Unloading Motor Trucks.

Chauffeur	$3.00 per day
6 men excavating and loading	10.50 per day
2 men unloading	3.50 per day
Gasoline	1.50 per day
Repairs, depreciation and expenses	4.00 per day
	$22.50

Or, at 45 tons a day, 50 cents per ton for one-half mile haul.

Horse-drawn wagons also are used on this half-mile haul—about twice as many as motor trucks. The time and cost of most of these was as follows:

Average Schedule.

Loading	10 minutes
Hauling	30 minutes
Unloading	6 minutes
	46 minutes for each 1½-ton load, or 2 tons per hour, or 20 tons per day.

Cost.

Wagon and teams	$5.50 per day
3 men excavating and loading	5.25 per day
2 men unloading	3.50 per day
	$14.25

The hauls on the above job varied from 1,200 feet to half a mile. On the 1,200-ft. haul precautions were taken against losing time in loading and unloading.

Average Schedule for 1,200-Foot Haul of 2½-Ton Buckets.

Loading	3 minutes
Hauling	13 minutes (round trip, including delays)
Unloading	2 minutes
	18 minutes for 2½ tons, or 8 1/3 tons per hour, or 83 1/3 tons per 10-hour day.

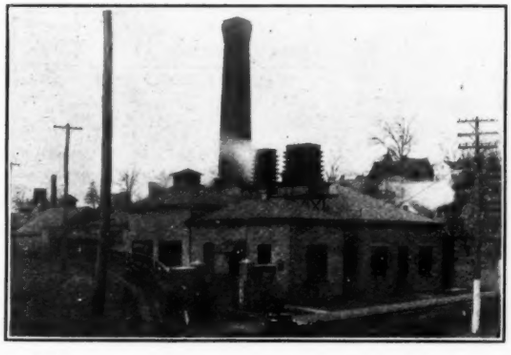
Electric Light Plant of South Norwalk, Conn.

A PROSPEROUS LITTLE MUNICIPAL PLANT

The former city of South Norwalk is now the second taxing district of the city of Norwalk, Conn., for the purposes of carrying on the municipal electric lighting plant, which, tho small, is very prosperous and shows the possibilities in the efficient management of small municipal plants in paying for the installations out of the proceeds at the same time that the rates are kept as low as those in other plants giving similar service under similar conditions. The article gives full information regarding the methods of accounting and is based, in this regard, on the annual reports of the Board of Electrical Commissioners. The photographs are furnished by courtesy of A. E. Winchester, the general superintendent of the system.

IN 1892 the citizens of the city of South Norwalk, now the Second Taxing District of the city of Norwalk, Conn., voted $22,500 to establish a municipal electric lighting plant, with the idea that a better street lighting service could be procured for longer time and at less cost than the city had been able to obtain from the local company, concerning whose service there was serious complaint. Albert E. Winchester, of the Edison engineering staff, was selected as consulting engineer to design the plant and supervise its construction. He has served the plant ever since, as consulting engineer, one of the Board of Electric Light Commissioners until 1902, and as general superintendent from 1897 until the present time. Undoubtedly a large part of the success of the plant is due to the continuation of a competent man in charge of it continuously, competency and continuity of service both being essentials to the most satisfactory operation of a public service plant, whether under private or municipal ownership.

SOUTH NORWALK ELECTRIC PLANT *as it stands, adjoining railroad, being three times its original size.*



The first installation included the middle section of the present main buildings, shown in one of the accompanying photographs, with an iron chimney, a horizontal boiler, a 100-h.p. Ideal engine, two 60-light dynamos, the pole line and 86 series open-arc lamps. These were all replaced by more modern installations in 1903.

In 1896 it was decided to consider the supply of current for commercial purposes, and Mr. Winchester made a thoro study of electric lighting thruout the United States, extending over nearly two years. A favorable report was made and the city voted $20,000 in 1897 for installing the additions necessary for the new service and $2,000 for working capital, which it was not necessary to use, as the income very soon became sufficient to support the plant easily.

New boilers and engines and dynamos and a brick chimney were installed, and the commercial service began in August, 1898, with six consumers having about 100 16-c.p. lamps. In October of the same year the street and commercial lighting systems were combined in operation and accounting, this being probably the first municipal electric plant in this country to control its income and operate within it.

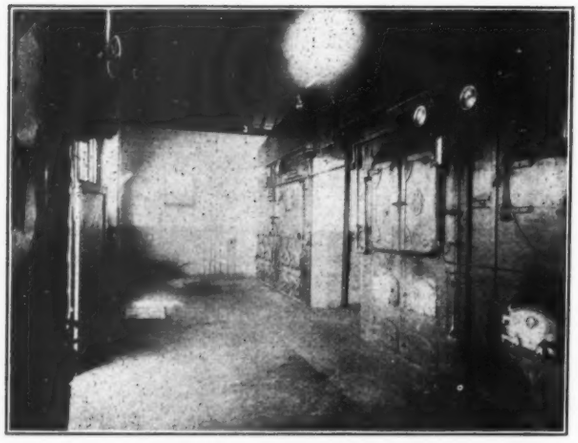
Within a year the commercial business had grown so much that an enlargement became necessary, and, after considering a flattering offer from the Connecticut Lighting and Power Company to buy or lease the plant, the city meeting voted $17,500 for the enlargement. The private company and its predecessors in the field had burdened the city with much litigation and threatened more, but in April, 1901, decided to withdraw all its suits. The legal expenses of the city on this account, amounting to $5,639.60, were charged to the investment account as covering the price of the plant's right to existence. Of late, the officials of the municipal and company's plants have co-operated when advisable and have cordial relationships at all times. Within about two months the service for electric motors, which had been operated for the municipal plant by the street railway company, was bought and connected with the generators in the city's plant and its area greatly extended.

The growth of both lighting and power service was such that $15,000 was voted in 1903 for enlargement, resulting in the replacement of the original installation above referred to by new apparatus of greater capacity, at a cost of $1,000 less than the appropriation.

The installations up to this time had been with steam engines. A fourth enlargement in 1905, at a cost of $22,000, was made with a Diesel oil engine as the motive power. Other enlargements in 1907 at a cost of $27,000, and in 1910 at a cost of $30,000, were made, a new Diesel engine being added each time. The last addition was paid for out of the profits of the plant, without increasing its bonded indebtedness. The commissioners purchased much of the material used and the operating staff made the extensions of the distributing system. The machinery installation was designed and put in by J. G. White & Co.

The flat-rate system of charging for service was superseded by the meter system in May, 1903, and at the same time service was continued all day, except Sunday daylight. It has been continuous every day and night since 1906. Since 1910 street lighting service has been all night every night without increasing cost to city.

For a few years, 1905 to 1911, steam was furnished the railroad company for heating waiting trains before connecting locomotives to them.



BOILER ROOM *of the South Norwalk electric plant, showing the four horizontal tubular boilers available.*

The fire alarm system of the city has been in charge of the lighting commissioners almost since the opening of the plant, and the police telegraph system was turned over to them in 1908, shortly after it had been installed by the police department.

East Norwalk, now the Third Taxing District of the city of Norwalk, began in 1908 to buy electric current of the South Norwalk plant for distribution to its citizens from its substation. In 1914 East Norwalk built its own generating plant and has now ceased taking supply from the South Norwalk plant, thus giving it capacity for some additional business in its own field before another enlargement will be necessary.

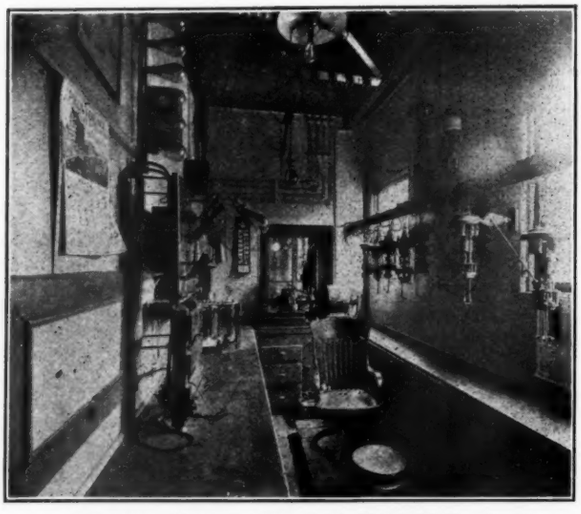
During 1913 the distribution system was overhauled and considerably increased by adding a new feeder and reinforcing a number of mains. The street arc lamps were also replaced by tungsten lamps placed at more frequent intervals, the 118 arcs and 48 tungstens of 1912 becoming the 40 arcs and 355 tungstens of 1913.

On October 11, 1913, two days prior to its twenty-first birthday, the last of the bonded indebtedness of the plant was paid, all from its surplus profits, so that nothing has been contributed to the cost from taxation. The net investment at that date amounted to $203,483.23. In 1914 the plant paid $10,000 into the municipal treasury of the Second Taxing District out of the profits of that year.

The power house shown in the photograph is practically fire-proof. The main part, built in 1892, was nearly doubled in 1900. It has a boiler room and an engine room, shown in two photographs.

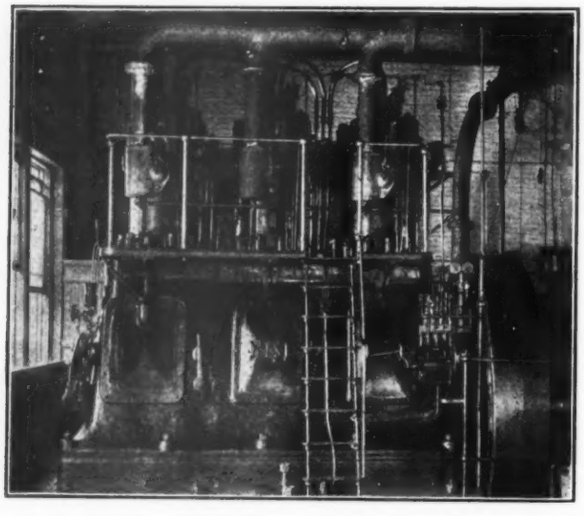
The boiler room has two 125-h.p. horizontal tubular boilers, installed in 1900, one in 1898 and one in 1914, which replaced one of the first boilers put in in 1892. The large brick chimney shown in the center of the plant in the first photograph is adjacent to the boiler room. It is founded on solid rock and has a fire-proof vault for records in its base.

The engine room has eight generating units. A was installed in 1903, replacing one of the first (1892) units, and is a 130-light Brush arc generator, direct connected to and driven by a 90-h.p. motor. B is of 165-k.w., installed in 1903. C and D are of 60-k.w. each, with Siemens-Halske generators, installed in 1898. E and F are of 60-k.w. each, with Eddy



METER AND LAMP LABORATORY *of the South Norwalk electric plant.*

DIESEL OIL ENGINE, *one of three in the South Norwalk electric plant.*



generators, installed in 1900. Each of these last five units is driven by a steam engine, there being four 100-h.p. and one 255-h.p. Watertown high-speed engines. G, H and I are of 160-k.w. each, with Fort Wayne generators, installed in 1905, 1907 and 1910, each with a 225-h.p. Diesel fuel oil engine installed at the same time. Each Diesel engine has a 25-h.p. motor-driven Norwalk air compressor.

Marbleized slate switchboard built in 1898 and enlarged in 1900, 1903, 1905, 1907 and 1910, duplex steam piping, exhaust and feed piping, two feed pumps, two feed-water heaters, steam whistle for fire alarms, telephone booth, fire-alarm apparatus, etc., constitute the miscellaneous equipment. A 3,350-gallon fuel-oil tank is buried under a shed across a driveway from the plant.

The conductors from the plant include 4 arc lines, 9 low-tension feeder leads to the cribbed lighting and power mains, 6 pressure wires, 2 for station service, 1 to the tower clock and lights at street crossings under bridges, and 8 for the fire-alarm service.

The financial statement showing the definite results of the methods of management, whereby the above stated results have been made possible, will be of interest.

The investment in the plant at the end of the last fiscal year was $206,718.32, but the actual value would be less, as no deductions have been made for depreciation.

The city issued $22,500 in bonds in 1892 for the original installation and $20,000 in 1898 for the commercial service addition. The sinking fund now contains $17,500 of cash in banks, drawing interest at 4 per cent., and $25,000 of city bonds, also drawing 4 per cent., so that it equals the bonded indebtedness and pays the interest until bonds come due. With cash in hand, $1,281 of unpaid consumers' bills, and stock supplies on hand, the book surplus is $220,338.33.

The income from city, street and municipal department lighting is $6,612.71; from commercial lighting, $47,249.43; from commercial power, $18,091.49; from interest accrued on sinking fund, $1,633.33; from merchandise and miscellaneous sales and insurance loss paid, $2,170.90, which, with an allowance of $156.22 for probably uncollectible accounts, makes the net income $75,601.64.

Maintenance cost $9,114.75, the large item, much larger than usual on account of a thoro going over, being $5,102.76 for the oil engines, compressors, etc. Operation of the power plant cost $26,184.85, of which the pay roll took $7,759.15; coal, $6,390.95; fuel oil, $9,280.74; water (paid the city water department), $868.19; oil, waste, etc., $1,182.72; supplies, $703.10. Distribution operation took $7,997.66, of which the pay roll took $2,224.35 and incandescent lamps $5,168.31. Meter reading, testing, etc., took $1,595.18, nearly all pay roll. Administration cost $3,740.11, of which $3,115.33 was pay roll. Interest cost $1,700. Insurance cost $529, of which $504 was against fire and $25 on the new electric truck. The total of maintenance and operation was $50,861.55. If we allow 7½ per cent. depreciation on the $201,078.72 investment in the plant, exclusive of non-depreciable items, the allowance will amount to $15,080.90. Taxes are estimated to be $2,412.94 if the plant were owned by a private company. This makes the total charges against the income $43,615.30, and leaves a net profit of $7,246.25.

Actually, the depreciation has been more than taken care of by the investments made in the plant from profits, and the plant is now a practically clear profit and the allowance for depreciation need not be taken.

The rates are said to be less than those of plants in neighboring cities under similar conditions. They are as follows:

To the city: Arc lamps, $54 per year for 350-watt lamps; incandescents, $10.80 a year for 70 watts or less; all night every night. Municipal buildings are supplied at cost by meter, amounting to $415.99.

For commercial light:

9 cents per k.w. hr. for first 100
8 cents per k.w. hr. for next 200
6 cents per k.w. hr. for next 200
5 cents per k.w. hr. for all over 500

with a minimum monthly charge of 55 cents.

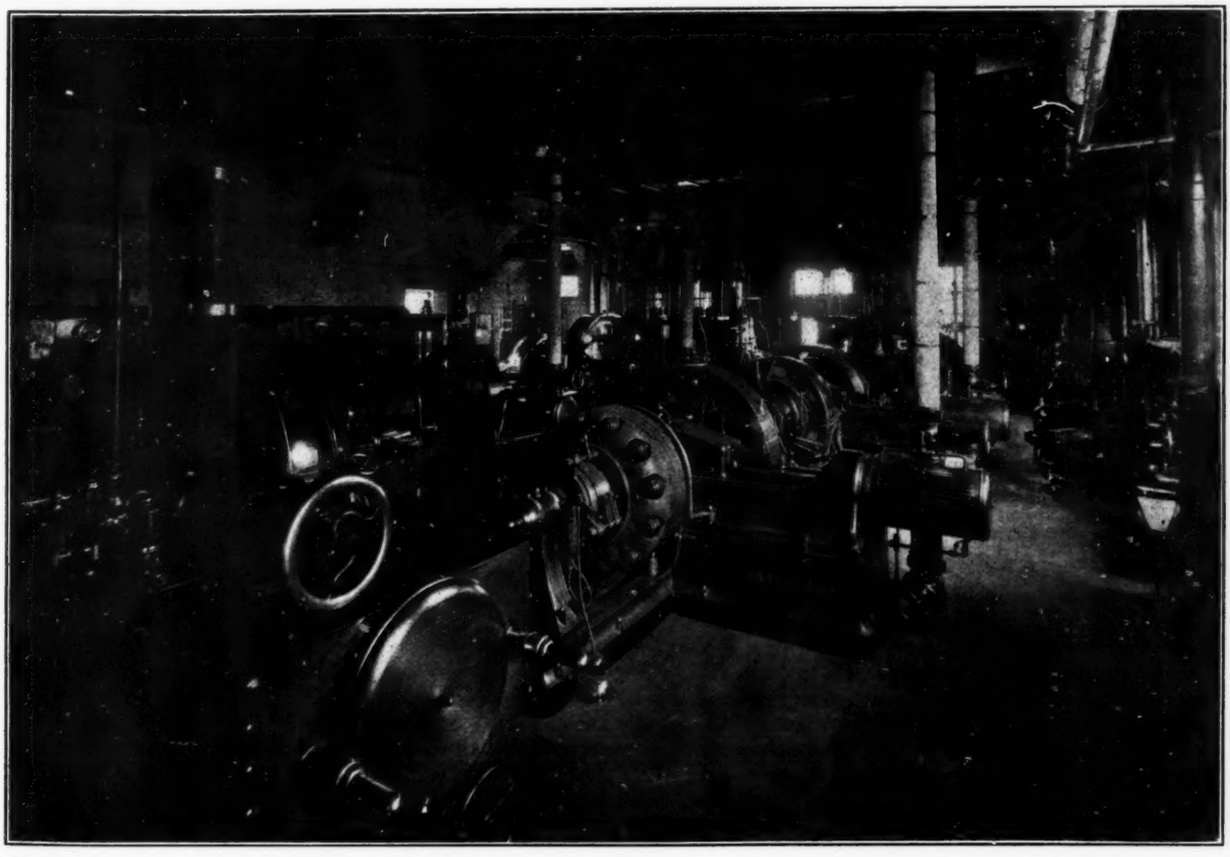
Outside arcs, $6 a month and incandescents, $1.20. Signs, special 20 per cent. discount from commercial rates, with minimum of $2.22 a month on separate meter, and no current used between 7 a. m. and 6 p. m.

For power:

5 cents per k.w. hr. for first 100
4 cents per k.w. hr. for next 400
3 cents per k.w. hr. for all over 500
Minimum charge, $1.11

Prepayment meters have rates of 10 cents for lighting and 5 cents for power, with no rebates.

ENGINE ROOM *of the South Norwalk electric plant, showing the five steam engine units in the foreground and three Diesel oil engines in the background.*



Rebate of 10 per cent. is allowed on regular rates if paid within ten days.

Free carbon lamp renewals, tungsten lamps sold at less than cost to consumers and arc lamps loaned free for regular service.

The average cost of power to nineteen consumers, whose bills were examined, was $18.12 per rated motor horsepower, the motor ratings varying from 4 to 100 horsepower each, with a total of 519 horsepower at full load.

The commissioners make a plea for lower rates, now that the plant is all paid for, and their position is well taken. Not all the citizens use the electric light, and if the profits of the plant are turned into the city treasury for the reduction of taxes, the customers of the plant are forced to pay the taxes of their neighbors who are not users of electricity or are users on a smaller scale. Since the electric light plant is operated as a public utility and is a practical monopoly, the customers being obliged to pay the rates charged, since there is no opportunity for competition, it is hardly fair to force them to pay more than is necessary to meet the financial demands of the plant and of a reasonable surplus fund to provide for emergencies.

The city should receive some payment for the burden which the plant and its operation puts on the streets, but beyond this, profits should be divided among the consumers of the current, either as rebates to constant users, made at regular intervals of possibly irregular amounts, or as reductions in rates to apply to future consumers.

PROPOSED NEW CHARTER FOR NEWARK, N. J.

A special committee of the Charter Revision Commission, consisting of City Counsel Spaulding Frazer, Frank H. Sommer and Frank E. Bradner, has prepared a draft of a new charter for the city of Newark.

As contrasted with the commission form of government, it endeavors to center in the mayor the responsibility for all administrative functions. The administrative work of the city government is apportioned among six departments, each headed by a director appointed by the mayor and subject to removal by the mayor. The powers of these directors include the designation of the duties of their various subordinates and the promotion, reduction, removal and general disciplining of these subordinates.

The six departments are: Finance, audits and accounts, public safety, public health, public works and public welfare. A city purchasing bureau is under the department of finance, and this department also performs the duties now performed by the comptroller, the treasurer and the receiver of taxes. To the department of audits and accounts are assigned the functions of the present auditor's office, to which is added the auditing of requisitions on the purchasing bureau. Public safety has charge of the police and fire departments. Public health has the administrative functions of the present board of health. Public works has all the administrative functions of the board of works and building department, the construction and maintenance of all public buildings, the acquisition, sale and lease of all city properties, and city planning. Public welfare controls all charitable and penal institutions, city charities and amusements, markets, baths, parks, playgrounds, shade trees, weights and measures, and general licenses.

Directors of all departments are required to submit, monthly and also upon request, reports of the work and financial conditions of their departments, and within thirty days after the expiration of every fiscal year similar reports for the whole of the year.

The council will consist of five members elected at large, each to hold office four years. One term will expire each year except in one of the four years, when two will expire. The council elects one of its members as president. He receives a salary of $6,000 a year. The others get $5,000 each. The powers of the council as to ordinances and resolutions are substantially those now exercised by the common council, board of works, board of health and shade tree commission, except for the administrative functions of these bodies. The council also has the licensing power of the present board of excise. Here is the home rule principle in concrete form. An attempt has been made to broaden the powers of the legislative branch of the government, that it will not be necessary to go to Trenton for the privilege of obtaining minor legislation of any sort. The concurrence of three members of the council is necessary for valid action by that body and this action is subject to veto by the mayor within ten days. The concurrence of four votes is necessary to overcome his veto.

BONDS.

The power of adopting the tax budget and of issuing bonds other than those in anticipation of taxes, and also the power of collecting assessments for local improvements, is taken away from the common council and vested in the board of estimate, consisting of the mayor, with three votes; the director of finance and the president of the council, with two votes each, and the remaining members of the council, each with one vote.

The board of estimate is required to prepare a tentative budget, print it and advertise public hearings on it before its final adoption prior to the first of July in each year. The board also has control over the issuance of city bonds and obligations other than those referred to, and over the municipal insurance fund.

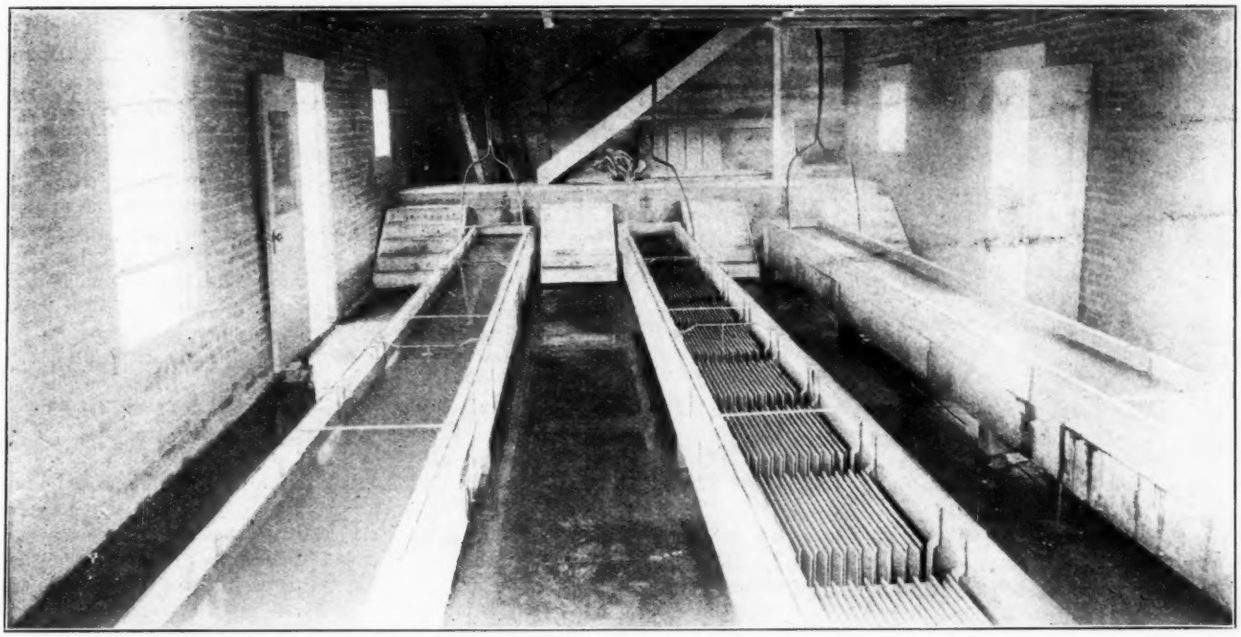
The present board of assessment and revision of taxes and the commissioners of assessment for local improvements have been combined in a single board, to be known as the board of taxation and assessment, consisting of three members.

The sinking fund commission is left practically as now.

The mayor's veto power over the common council under the new charter is exactly the veto power he has over the board of works.

In what might be called the "home rule section" of the proposed charter it is provided that the common council shall have the power to enact ordinances and resolutions on any subject affecting alone the internal affairs of the city, "so far as such ordinances and resolutions are not inconsistent with the provisions of this act or the general laws of the state now in force or hereinafter to be adopted; it being the intention of this act to grant the power to initiate and adopt all legislation reasonably necessary or convenient for the due government of its people and the administration of its affairs without the necessity of recourse from time to time to the legislature of the state."

In the section relating to the sinking fund commission this provision occurs: "If at any time it shall appear that the funds available to such commission from all sources for the purpose of paying bonds at their respective maturities shall exceed the amount reasonably necessary to make such payments at the respective maturities of such bonds, the sinking fund commissioners may by resolution determine the amount of such receipts in excess of the amounts required by them for the purposes aforesaid, and may pay over such excess in any year into the general treasury of the city."



THE TROUGHS WITH THEIR ELECTRODES IN WHICH SEWAGE IS TREATED.

Electrolytic Sewage Treatment Plant

AT DURANT, OKLAHOMA.

By W. L. Benham, Consulting Engineer, Oklahoma City, Okla.

The designing engineer of this electrolytic sewage treatment plant gives a brief description of its design and full extracts from the report of the results of its operation by the state's bacteriologist. Figures of cost are not given in detail, but the cost for electric current is estimated. Further experiment to ascertain methods of increasing efficiency without excessive cost are suggested in the report and the article.

IN the early part of 1914, the council of the city of Durant, Okla., decided to build a modern sewage treatment plant to take care of the increasing needs of the municipality for the treatment of sewage, and after considerable investigation it was decided to build an "electrolytic" treatment plant. The site was located northeast of the city on ground at such an elevation that the effluent from the plant could be emptied into a small creek, which is always dry except during rainy periods. The sewage is carried to the plant by two separate main outfall lines. The plant was put in operation in August, 1914, during a very dry period, and after some time it was decided to have a test made, which would show the efficiency of the treatment. During the month of August, under the direction of L. G. Lautzenhiser, of the Electro-Sanitation Company, Los Angeles, Cal., continued series of tests were made by Prof. Louis A. Turley, at that time state bacteriologist of Oklahoma, and a report was made by him covering his findings.

The plant is a combination of a two-story settling basin, a storage reservoir, generator house, trough house where the electrolytic troughs are located, and a sludge bed.

The settling basin is of reinforced concrete, 30 by 40 feet inside measurement and 12 feet deep. The bottom of these basins is composed of fifteen inverted pyramids in the form of hoppers, and each is provided with a bottom drain so arranged that sludge can be drained out onto the sludge bed or into the adjoining creek. This arrangement is accomplished by means of valves placed in manholes outside of the basin. The drain pipes and valves are so arranged that the transverse hoppers or bottoms can be drained in sets of three at a time, there being five manholes with two valves in each. It was the idea that sufficient drainage could be accomplished with a much less depth than if fewer drains were provided, and to permit the entire basin to be drained at times when it might become necessary, due to sludge deposits, to clean out the basin, also to inspect the interior at any time. The bed of the creek is about 2 feet lower than the bottom of the hoppers, thus providing ample fall. These drains are cast iron bell and spigot pipe, 8 and 10 inches in diameter.

Above the drainage hoppers at a distance of about 3 feet were constructed Y-shaped troughs or hoppers, which extend across the basin at right angles to the long side. The apex of these troughs is 6 feet below the top wall of the basin and 4 feet below the water level. The bottoms of the troughs are 8 feet 9 inches below the water level. The side of each trough or hopper at the bottom overlaps by about 6 inches the other side, so as to prevent any solid matter from rising to the surface, due to gas bubbles. At the apex of the troughs are provided fourteen vents so arranged as to allow the scum and gases to rise to the surface. These vents are 8 feet apart on centers, and at the apex of each trough there is provided a scum drain of 8-inch cast iron pipe equipped with a valve, so that scum or floating sludge can be carried off from time to time to the sludge bed. The hoppers are constructed of 2 by

EXTERIOR VIEW *of electrolytic sewage treatment plant at Durant, Okla. Settling basin in rear. Motor-generator room under sloping roofs in center. Electrolytic apparatus in building in front. Effluent to creek at left.*

6-inch oak tongue and grooved lumber, as are also the vertical vents.

The storage basin is of reinforced concrete and of 72,000 gallons capacity. The idea of this basin is to allow the effluent from the settling basin to be stored up and to permit the sewage to be treated intermittently, thus avoiding the necessity of running the plant continuously. The basin was designed with a view of taking care of the night flow.

Above the storage basin is a motor generator house or room in which are placed the generators. These generators are composed of three separate units, specially designed so as to generate current at the rate of 400 amperes and 4 volts. A separate switchboard is provided for each generator, on which are mounted ammeters, voltmeters, rheostats, starting boxes and switches.

From the storage basin the sewage is conducted to the electrolytic troughs, which are housed in a brick building. The flow is controlled by means of valves at the upper end of each trough. There are three troughs holding the electrodes, these troughs being 30 feet long, 22 inches wide and 18 inches deep, inside measurement. From the troughs the sewage empties into a concrete open channel, thence is carried to a manhole into the creek. A flap valve is provided at the creek to prevent the backing up of flood water.

At the side of the trough house is located the sludge bed 20 feet wide, 40 feet long and 3 feet deep. This trough is provided with underdrains, which consist of 6-inch vitrified sewer pipe laid with open joints. On top of these drains is selected sand. The subdrains are connected with an outfall line to the creek, which is also provided with a valve to prevent the backing up of water from the creek.

The process of treatment is as follows:

Sewage from the mains is discharged into a concrete channel extending the full length of the settling basin and is admitted to the basin by means of five conduits, open at the top, which descend thru the wall of the chamber and open into same a little below the level of the apexes of the hoods or troughs and between them. The tank was designed with a view of retaining the sewage for a 2-hour period based on one-eighth of the average flow, and tests have shown that this result has been accomplished. Accurate gagings of sewage were taken before the tank was designed. The sewage flows from the entrance chamber across to the other side and into another concrete channel or flume bracketed to the side wall, it being necessary for the sewage to flow over weirs into this channel.

From the settling basin or compartment and thru the bracketed channel the sewage flows to the reservoir or equalizing basin and is stored there until the basin is filled. Then the treatment process is started and the sewage is admitted to the electrolytic troughs, where it is allowed to flow thru each trough at the rate of about 7,000 gallons per hour, which rate has been demonstrated to give the best results. The troughs may be operated separately or all at one time.

There are ten sets of electrodes in each set, consisting of twenty-seven plates ½ inch in thickness and separated from each other by a vulcanized rubber bushing. These electrodes sets are suspended by means of bars from side of the trough and connected to bus-bars extending along the side. Metal baffles are provided in each trough, so as to divert sewage thru plates and eliminate dead pockets. On top of each plate is a copper strip bent over each plate. The accompanying drawings show the general construction of the plant as a whole, and should be readily understood.

The following is abstracted from the report of Prof. J. A. Turley, dated September 5, 1914:

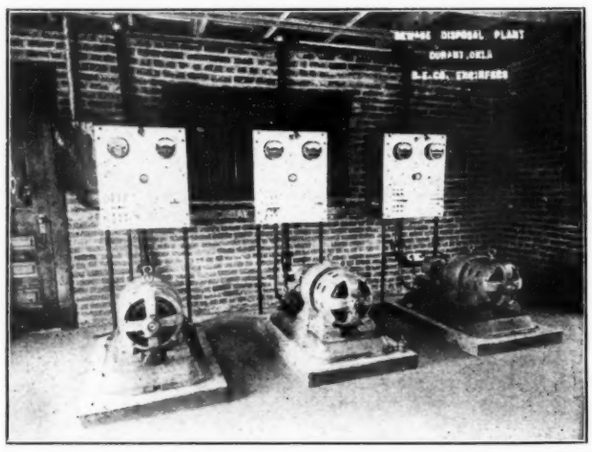
Durant was selected as the place to make the tests on account of the character of its preliminary treatment of the sewage.

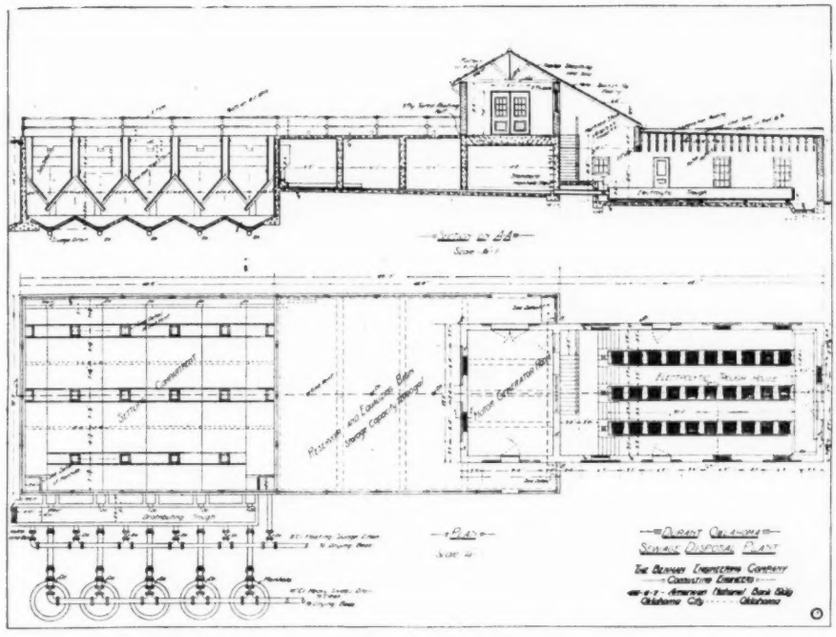
Durant's population is about 7,500. It has separate sewers with 434 connections with the domestic system, including two laundries, five hotels, six boarding houses, six restaurants, five confectioneries with soda fountains, and five drug stores with soda fountains, and no trade wastes other than the laundries. After a heavy rain the sewage becomes a mass of heavy mud, on account of the dirt that is washed thru the manholes, and a considerable quantity of ground water seeps thru the walls of the manholes into the sewers.

The average daily quantity of sewage is estimated at 428,000 gallons, about 20,000 gallons per day coming from the laundries. The sewage from the laundries is fairly uniform, and contains a washing compound known as "Wyandot," which is a soda preparation. The sewage from other sources is most variable in amount and character. Besides the usual kitchen and bathroom wastes, all manner of articles that can be gotten into the sewer come to the plant. These include newspapers, cloths, vegetable and fruit refuse, drawings of fowls and various insoluble matter. Of course, a large part of these was caught by the screen and in the inlet channel, but a considerable amount passed thru the screen and into the chamber. Ground water dilutes it considerably at times, especially during and for a day or two after a heavy rain.

The solid matter in the sewage was quite variable at different times during the twenty-four hours. The sewage in the chamber was comparatively clear and free from solid matter early in the morning, so that some mornings the chamber might easily have been mistaken for the reservoir of the city waterworks. About 9:30 the sewage began to be murky, and

MOTOR-GENERATOR ROOM *in Durant electrolytic sewage treatment plant.*





PLAN *of electrolytic sewage treatment plant at Durant, Okla. Settling basin at left. Reservoir and equalizing basin in center. Electrolytic troughs at right.*

the solid matter to increase. This increase continued until 5:00, at which hour we usually left the plant, and it probably extended into the night. But some time during the night after the kitchen wastes for the day have been turned into the sewer, the sewage began to clear.

In the description of the chamber above given, mention was made of the fact that the solid matter on being discharged into the chamber would sink and pass under the hoods. In general this was the result, but it did not wholly work out in practice. The greater part of the solid matter did settle to the bottom, but a considerable part of it rose to the top and floated about as scum. This took place to such a degree that it was necessary to skim the chamber frequently, and the odor of this matter decaying on the surface was at times quite offensive. Besides these objections, this solid matter passed over the weir, and so went to the electrolytic troughs, and, of course, passed thru them little, if any, changed, and appeared with the treated effluent as raw sewage at the discharge of the latter into the stream bed. No system of purification could be expected, in the time the sewage was passing thru the troughs, to dispose of decomposed pieces as large as a marble, as were many of the pieces noticed. This condition was observed when the plant was first visited, and its significance as affecting the effluent was fully appreciated; but it was thought best to test the plant as it was before suggesting any changes. Accordingly, the testing was begun as soon as possible, and the tests included in the "First series" below are those made with the plant in this condition. At the end of this series it was suggested to the authorities that the condition should be changed. It was further suggested that this could be accomplished by running chutes from the orifices into the chamber to conduct the entire sewage under the hoods, where all the solids, the floating as well as the heavier, could be confined, thus avoiding the scum and the carrying over of undigested solids to the treating troughs.

This suggestion was carried out, and it was found that not only was the scum done away with and the raw floating matter arrested, but better circulation in the settling chamber was established. This was also increased by cutting recesses 2 feet wide and 6 inches deep in the wall of the weir to the discharge channel. These recesses, five in number, were cut in line with the vent flues rising from the apexes of the hoods. The water level was thus lowered about 4 inches, and the period of retention slightly reduced.

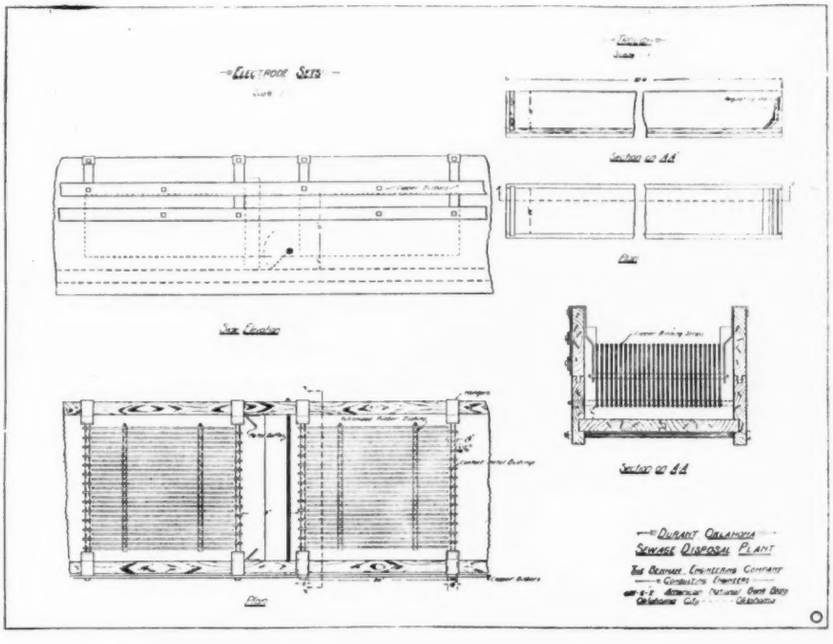
STABILITY TESTS.

Methods and Apparatus.

The methods employed in making the tests were the methods recommended by the American Public Health Association in the edition of their report on "Standard Methods for the Examination of Water and Sewage."

For the testing of the stability of the sewage, treated and untreated, Merck's methylene blue was employed as an indi-

DETAILS OF ELECTRODE SETS, *showing plan side elevation and cross-section of electrode plates in trough. In upper right-hand corner are plan and section of the empty trough, showing its construction.*



cator, using the medicinal zinc salt. As these were field tests, the samples were incubated at the best available temperature, which was 26 deg. C, lowering the stability index as the decolorization of the methylene blue was effected considerably faster at this temperature than it would have been at 20 deg.

In the following tables all treated samples were taken from the discharge end of the electrolytic troughs; and the flow was considered normal when the depth of the water over the weir at the end of the trough was 1½ inches. A reduced flow means an amount less than this. When no depth of flow is mentioned the discharge was normal.

The figures in the third column refer to the hour of day at which the methylene blue was added and the incubation begun, which was always as soon as possible after the samples were taken. However, a full set was taken before any were incubated.

giving a bad character to the sewage effluent, from the troughs.

The sewage contained a very high percentage of dissolved solids, in part due to the water used in flushing, and to that entering the sewers from the connections with the system, which, altho city water, had a high chemical content. But for the most part it was due to the dilution of the sewage, to the time of day, and to an extent to the day of the week.

The effect of the ground water is noticeable in tests Nos. 6, 33, 34 and 35. This effect was of variable duration, in proportion to the severity of the rain, but it began to disappear the second day after the rain, and by the third day it was scarcely noticeable. The effect of the time of day is illustrated in tests Nos. 23 and 26; also in Nos. 17 and 19. The effect of the day can be seen in tests Nos. 19 and 21.

To meet these conditions three courses were open: First, to artificially dilute the sewage at times when it was not di-

STABILITY TABLE

Test No.	Date Day	Hr.	Current Amps.	Volts	Source of Sample	Hours Incub.	Condn.	Results % Sta.	Remarks
					FIRST SERIES				
1	8/10	3:			Last manhole	*	Clear		
2	8/10	3:			Reservoir	*	Clear		
3	8/10	3:	200	3	Trough No. 1	36	Tinted	30	
4	8/12	10:			Last manhole	*	Clear		Heavy rain
5	8/12	11:			Reservoir	*	Clear		for two
6	8/12	11:	300	5	Trough No. 1	480	Blue	100	days
7	8/14	12:			Last manhole	*	Clear		
8	8/14	12:			Reservoir	8	Clear	7	
9	8/14	12:	300	5	Trough No. 1	60	Tinted	44	
10	8/15	11:			Last manhole	3	Clear	3	
11	8/15	11:			Reservoir	3	Clear	3	
12	8/15	11:	300	4.2	Trough No. 1	48	Clear	37	
13	8/15	11:	400	5.5	Trough No. 1	48	Clear	37	
14	8/16	11:			Reservoir	12	Clear	11	
15	8/16	11:	350	5	Trough No. 1	42	Clear	32	
16	8/17	11:			Reservoir	30	Clear	28	Monday morning
17	8/17	11:	300	5	Trough No. 1	480	Blue	100	Monday morning
18	8/17	4:			Reservoir	5	Clear	5	Monday afternoon
19	8/17	4:	300	4.2	Trough No. 1	30	Clear	28	Monday afternoon
20	8/18	5:			Reservoir	2	Clear	2	
21	8/18	5:	300	5	Trough No. 1	18	Clear	16	
					SECOND SERIES				
22	8/24	11:			Reservoir	12	Clear	11	Monday
23	8/24	11:	200	4.5	Trough No. 1	56	Clear	42	Monday
24	8/24	4:			Reservoir	4	Clear	4	Monday
25	8/24	4:	200	3.7	Trough No. 1	15	Clear	14	Monday
26	8/24	4:	200	3.7	Trough No. 3	15	Clear	14	Monday
27	8/25	4:			Reservoir	4	Clear	4	
28	8/25	4:	300	4.7	Trough No. 1	28	Clear	25	
29	8/26	4:			Reservoir	4	Clear	4	
30	8/26	4:	300	4.8	Trough No. 1	64	Clear	47	Flow ½ normal
31	8/26	4:	300	4.2	Trough No. 3	18	Clear	17	
32	8/28	5:			Reservoir	27	Clear	24	Heavy rain 27th
33	8/28	6:	300	5	Trough No. 1	76	Tinted	52	in the forenoon
34	8/28	6:	300	5	Trough No. 3	66	Clear	48	
35	8/28	7:	300	5.2	Trough No. 1	192	Blue	100	Flow ½ normal
36	8/29	5:			Reservoir	12	Clear	11	
37	8/29	5:	300	4.8	Trough No. 1	96	Clear	60	
38	8/29	5:	300	4.8	Trough No. 1	168	Blue	100	Flow 2/3 normal
39	8/31	4:			Reservoir	2	Clear	2	
40	8/31	4:	300	5	Trough No. 1	24	Clear	21	
41	8/31	4:	360	5.8	Trough No. 1	27	Clear	24	
42	8/31	4:	300	5	Trough No. 1	48	Clear	37	Flow ½ normal

Samples 1, 2, 4, 5 and 7 were left at the field laboratory over night, and were clear a little after 7:00 the following morning, none having held the color more than twenty hours.

No average of the stability numbers obtained will give any fair idea, either of what the plant in Durant is doing or of what the electrolytic process will do toward purifying sewage effluent.

As soon as the first treated sample, No. 3, had decolorized, it was seen that 200 amperes was not current enough to produce a desirable stability in the effluent; consequently, 300 was tried, then 400, 350 and later 360; but it was found that any amperage above 300 did not give enough better results, if any better, to make up for the use of the additional current.

The changes made in the structure of the settling chamber had no effect on the character of the sewage, so far as the content capable of being affected by the treatment was concerned; but they did get rid of the lumps of undigested matter and of all kinds of floating objects, making odors and

luted by rains; second, to increase the electric charge; third, to prolong the treatment. Artificially diluting the sewage would require the addition of flush tanks in the up-town system, or the addition of water at the plant, both of which would be expensive. There was a limit beyond which the increase in current does little if any good. There were two means of increasing the duration of the treatment: Lengthening the troughs, the addition of more batteries, or reducing the amount of sewage flowing thru the troughs, which would mean a longer retention and more treatment. This was a very simple experiment, and the one that entailed no outlay of money.

The effect of thus reducing the quantity, and the consequent prolongation of the treatment of the sewage can be seen by comparing test No. 30 with No. 31, No. 35 with No. 33, and No. 38 with No. 37. Enough tests were made to demonstrate that by a proper increase in the duration of the treatment a perfectly stable effluent could be discharged from the troughs

under the most adverse conditions. The only objection to this reduction in the flow would be that the sewage coming to the plant might not be handled fast enough. But this can be overcome to a great extent by increasing the flow at such times as the sewage is low in dissolved solids; e. g., in the morning. The necessity of much reduction in the flow could probably also be avoided by placing the electrode plates of the batteries closer together, thus doing away with some resistance to current; and with successful removal of solid matter in suspension, and floating matter, there is no necessity for plates being so far apart.

BACTERIOLOGICAL TABLE

Sample No.	Date Day	Hr.	Current Amps.	Volts	Source of Sample	Total B. per cc	Reduction	Acid B. per cc	Reduction	Rate of flow
					FIRST SERIES					
1	8/15	11:			Last manhole	9360000		100000		
2	8/15	11:			Reservoir	Spoiled		23000		
3	8/15	11:	300	4.2	Trough No. 1	1020000	89%	None	100%	Normal
4	8/17	4:			Last manhole	13000000		290000		
5	8/17	4:			Reservoir	9000000		250000		
6	8/17	4:	300	4.2	Trough No. 1	550000	94%	None	100%	Normal
7	8/18	5:			Last manhole	1600000		360000		
8	8/18	5:			Reservoir	1900000		270000		
9	8/18	5:	300	4.3	Trough No. 1	400000	79%	16000	94%	Normal
					SECOND SERIES					
10	8/24	4:			Last manhole	5100000		350000		
11	8/24	4:			Reservoir	2800000		290000		
12	8/24	4:	200	3.7	Trough No. 1	800000	72%	21500	93%	Normal
13	8/25	4:			Last manhole	3400000		320000		
14	8/25	4:			Reservoir	6100000		350000		
15	8/25	4:	300	4	Trough No. 1	650000	89%	8000	98%	Normal
16	8/28	6:			Reservoir	2200000		390000		
17	8/28	6:	300	5	Trough No. 1	750000	66%	8000	99%	½ Normal
18	8/29	5:			Reservoir	3700000		590000		
19	8/29	5:	300	5	Trough No. 1	450000	88%	5500	99%	2/3 Normal
20	8/31	5:			Reservoir	3300000		130000		
21	8/31	5:	300	5	Trough No. 1	150000	95%	1000	99%	½ Normal
22	9/1	5:			Reservoir	1400000		210000		
23	9/1	5:	300	5.4	Trough No. 1	250000	85%	1500	99%	½ Normal
24	9/2	4:			Reservoir	5400000		120000		
25	9/2	4:	300	4.7	Trough No. 1	150000	97%	3500	97%	Normal
26	9/2	4:	300	4.7	Trough No. 1	150000	97%	1500	99%	½ Normal
27	9/3	5:			Reservoir	2400000		220000		
28	9/3	5:	300	4.2	Trough No. 1	500000	79%	11000	95%	Normal
29	9/3	5:	300	4.2	Trough No. 1	200000	92%	2500	99%	½ Normal
					Average		86%		97.7%	

BACTERIOLOGICAL TESTS.

An incubator was constructed at the plant by taking two tight boxes, one about 3 inches larger in all its dimensions than the other. These boxes were lined on the inside with heavy cardboard from large packing cartons. The heat was furnished by two electric lights in the outer box. The regulation of the temperature was accomplished by means of an electric thermo-regulator, which employs the differential expansion of metal. When the incubator was finished and connected it was regulated at 37.5 deg. C, and did not vary one degree during the entire set of experiments.

The dry-air sterilizer was an oven for a two-burner gasoline stove on a one-burner blast stove with a vertical flame. The water with which to make dilutions was sterilized in an enameled coffee pot, being for the most part rain water caught during storms in a clean vessel placed in the open, the remainder of the water for dilutions coming from a well 52 feet deep. Every precaution was taken to avoid bacteria gaining entrance to the vessels, the media and the diluting water. Nevertheless, it is not only possible, but probable, that some bacteria did gain entrance from the air, as it was impossible to avoid drafts, more or less dust-laden, and the difference in the per cent. reduction between the total content and the acid bacteria, as shown in the following table, is, in a large measure, due to this fact.

It was not possible under the circumstances to follow either method "A" or method "B" as recommended by the American Public Health Association. Accordingly, the samples of sewage were diluted and inoculations made into nutrient agar plates for total count, into litmus lactose agar plates for acid colonies, into dextrose broth and bile broth, in fermentation tubes for gas, and into litmus milk. The results of these inoculations were carefully watched. Readings of the agar plates were made at twenty-four hours and at forty-eight hours; the gas analyzed for the $H:CO_2$ proportions and all results recorded, as shown in the following table, and in greater detail, in the table on the last page of this report. The sample numbers in the tables correspond.

The above samples were taken at the same hour that the samples for the stability tests were taken, and under the same conditions; but as the stability tests were begun some days earlier than the bacterial tests, and from a different series, the numbers of the samples do not correspond. They should be compared by the date and hour.

In samples Nos. 1, 2 and 3, the dilution used for the total count was one in ten thousand for the treated and untreated alike, and the dilution for the other cultures was one in one thousand. This was considered too low for the total count, and in the case of the treated sample, too high for the other cultures. The second set of samples Nos. 4, 5 and 6 were handled differently. The untreated samples were diluted one in 1,000,000 for the total count, and one in 10,000 for the other cultures. The treated sample was diluted one in 50,000 for the total count, and one in 500 for the other cultures. The dilution of the untreated samples was one in 100,000 for the total count. The dilution of the treated samples as applied to the second set seemed to be right, except during the latter part of the work, when the flow was reduced; but as the time was short and the facilities did not admit of the necessary experimentation, the same dilution was continued thruout. If a lower dilution had been used for these samples, no doubt a more accurate result would have been obtained.

The computation of the reduction of the total bacterial content in the first set of samples is based on the bacterial content of the sample taken from the manhole, as the sample taken from the reservoir contained an organism that grew so rapidly that it concealed many other colonies of slower growing bacteria. The same organism was met with several times later, and it always covered at least one-third to one-half of the plate in twenty-four hours. In the case of the litmus lactose agar plates, some of the colonies that appeared blue in twenty-four hours had lost their color by forty-eight hours. And in some cases by forty-eight hours some of the red colonies

were overgrown and obscured, so that in a number of cases more red colonies were evident at the end of twenty-four hours than at the end of forty-eight hours.

Mention has already been made of the probability of extraneous contamination gaining access to the cultures during the manipulations of diluting and planting. This is not entirely speculation, for mold was frequently found on the plates. The presence of this contamination is the most probable explanation of the low reduction of the total bacterical content, as also the lack of uniformity in the amount of reduction of the total content. So the reduction of the acid bacteria can be taken as a more exact index of the reduction of bacteria by the process, for the reason that the likelihood of any acid bacteria being borne by air and dust, especially in this particular instance, is so remote that we are safe in assuming that all of those appearing in the cultures were in the sewage.

It will be noticed in the above table that the dilution of the sewage by rain had little if any effect on the bacterial content, a fact that was due to the addition of bacteria to the rain water on its way to the sewer from the streets and soil, and also in part to the fact that the dilution preserved some of the bacteria that would have been killed by the putrefactive processes had the sewage been more concentrated.

Since the prolongation of the treatment by the reduction of the flow had such a marked effect on the stability of the effluent, it was hoped that a similar effect would be noticeable in the reduction of the bacteria, as this reduction, in such a process, is due to the germicides produced in the sewage during electrolysis. However, though it did aid in the reduction of the bacteria to a degree, the increased percentage of reduction was disappointingly small, being but 5 per cent. in the total content and 3 per cent. in the acid bacteria. But when the reduction was already so great as it was in the case of the acid bacteria, it is hardly to be wondered at, as it is far more difficult to get rid of the last two or three per cent. than it is to raise the percentage to that point. So that, while the results of reducing the flow are not, on their face, very flattering, they mean more than a much greater increase in percentage would if the percentage were not already so high.

DETAILS OF BACTERIOLOGICAL TESTS

Electrolytic Treatment of Sewage. Cultures Durant, Oklahoma, August and September, 1914.

	Plain Agar			Limus Lactose Agar			Dextrose Broth		Bile Broth		Litmus Milk		
Sample	No. of Colonies			No. of Colonies			48 hrs.		48 hrs.				
No.	Dilution	24 hrs.	48 hrs.	Dilution	24 hrs.	48 hrs.	% Gas	H:CO2	% Gas	H:CO2	Condition	Reaction	Reading
						FIRST SERIES							
1	1:10000		936	1:1000		100	35	5:2	30	5:1	Coagulated	Acid	
2	1:10000	Plate ruined		1:1000	23	23	70	4:3	56	9:5	Coagulated	Acid	
3	1:10000		102	1:1000	None	None	None	....	30	22:8	Precipitated	Neutral	
4	1:1000000	5	13	1:10000	29	22	55	9:4	60	9:4	Precipitated	Litmus Reduced	24 Hours
5	1:1000000	4	9	1:10000	22	25	15	2:1	75	9:4	Coagulated	Acid	24 Hours
6	1:50000	3	11	1:500	None	None	48	3:1	None	....	Coagulated	Acid	48 Hours
7	1:100000		16	1:10000	36	27	45	2:1	60	2:1	Coagulated	Acid	24 Hours
8	1:100000		19	1:10000	27	16	50	7:3	60	2:1	Coagulated	Acid	24 Hours
9	1:50000		8	1:500	32	20	38	14:5	18	2:1	Coagulated	Acid	24 Hours
						SECOND SERIES							
10	1:100000	17	51	1:10000	27	35	12	3:1	60	2:1	Coagulated	Acid	24 Hours
11	1:100000	14	28	1:10000	29	29	45	2:1	58	20:9	Coagulated	Acid	24 Hours
22	1:50000	10	16	1:500	41	43	22	17:5	18	2:1	Coagulated	Acid	24 Hours
13	1:100000	23	34	1:10000	32	31	55	7:4	70	9:5	Coagulated	Acid	
14	1:100000	44	61	1:10000	35	25	55	7:4	60	1:1	Coagulated	Acid	
15	1:50000	13	13	1:500	6	16	55	7:4	40	3:1	Coagulated	Acid	48 Hours
16	1:100000	18	22	1:10000	33	39	15	2:1	48	3:1	Coagulated	Acid	24 Hours
17	1:50000	12	15	1:500	2	4	None	....	None	....	Precipitated	Neutral	48 Hours
18	1:100000	22	37	1:10000	26	59	90	1:1	18	2:1	Coagulated	Acid	48 Hours
19	1:5000	3	9	1:500	11	Obliterated	70	9:5	None	....	Coagulated	Acid	48 Hours
20	1:100000	25	33	1:10000	13	Obliterated	68	19:11	70	9:5	Coagulated	Acid	24 Hours
21	1:50000	2	3	1:500	1	2	None	....	None	....	Coagulated	Acid	48 Hours
22	1:100000	7	14	1:10000	21	19	72	5:4	35	5:3	Coagulated	Acid	48 Hours
23	1:50000	1	5	1:500	3	3	35	5:2	None	....	Coagulated	Acid	48 Hours
24	1:100000	39	54	1:10000	12	Obliterated	65	8:3	40	4:3	Coagulated	Acid	24 Hours
25	1:50000	3	3	1:500	7	7	36	3:2	35	5:2	Coagulated	Acid	24 Hours
26	1:50000	2	3	1:500	None	3	45	5:4	55	7:4	Coagulated	Acid	48 Hours
27	1:100000	24	24	1:10000	12	22	28	9:5	45	2:1	Coagulated	Acid	24 Hours
28	1:50000	10	10	1:500	20	22	50	17:8	20	3:2	Coagulated	Acid	24 Hours
29	1:50000	3	4	1:500	2	5	45	2:1	None	....	Precipitated	Alkaline	24 Hours

The reading of the Milk Cultures of 1, 2 and 3 was taken at the end of 24 hours. At 48 hours it had not changed.

CONCLUSION.

Altho time would not allow of enough tests to clear up all points, nevertheless it is evident from the above experiments and the results obtained that, if the treatment is adapted to the character of the sewage, an effluent will be obtained stable in character and with a bacterial content reduced to a minimum.

The cost of operating the plant for current of approximately 400,000 gallons of sewage per day at the rate of 2 cents per k.w. is about 90 cents. Recently the city completed a garbage and incinerator plant which was built next to the sewage treatment plant, and one man looks after both of these. The cast iron plates have not been renewed and are at this time apparently in good condition, altho the copper strips are corroded and will require replacement soon.

As far as the writer has been able to ascertain, the plant is giving excellent satisfaction, and there have been no complaints of any kind.

All plans and specifications were drawn up by the Benham Engineering Company, consulting engineers, Oklahoma City, and the work was installed under their supervision and that of the city engineer, W. P. Danford.

WORKERS IN THE FIELD

Municipal Plant Shows Profit

The Editor of MUNICIPAL ENGINEERING:

Sir—Altho the Cleveland Electric Illuminating Company has reduced its rate, this rate is still higher than the rate charged by our municipal plant.

Large as well as small consumers will profit by the illuminating company cut. The 10-cent unit schedule still exists, but the 5-cent schedule has been eliminated. The 3-cent schedule has been reduced to 2½ cents.

With this new cut the illuminating company has reduced its income by a larger amount than it would have done by reducing the residence lighting rate to 3 cents, as demanded by the city.

The company's cut reduces for business concerns the price of power, for which 10 cents a unit formerly was charged for the first thirty-six hours and for which 5 cents a unit was charged for the next thirty hours' use of power, and where all in excess of this amount was charged for at the rate of 3 cents a unit.

While the 10-cent rate has not been changed, it covers but thirty hours' time against thirty-six hours on the old schedule, while 2½ cents, instead of 3 cents, is charged for the excess over thirty hours.

Four thousand new consumers have been placed on the books of the municipal lighting plant since January 1. The number of consumers January 1 was 9,467; August 1 there were 13,423 names on the books. The total number of consumers added in July was 669. Receipts from the sale of current amounted to $43,257.34 in July and the net profit for the month was about $5,000, after allowance was made for interest on the bonds and the sinking fund payments for the redemption of the bonds when they mature.

There is a cash balance in the lighting department operating fund of $105,640. The net profit for the year will be $100,000.

F. W. BALLARD,
Commissioner of Light & Power, Cleveland, O.

Concrete Alley Paving in Chicago

The Editor of MUNICIPAL ENGINEERING:

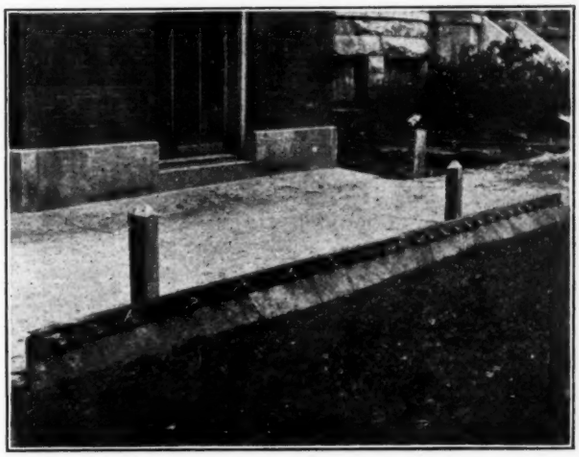
Sir—Within the last few years Chicago, with its customary "I will" spirit of determination, has undertaken the huge task of paving its 1,778 miles of alleys with hard, durable surfaces, easily kept clean. Previous to this, alleys in the downtown business district were paved, generally with brick or stone blocks; but it is only since about 1910 that the movement for eliminating the muddy, refuse-strewn and unsanitary condition of alleys in the residence districts has made any considerable headway on a large scale.

According to Illinois law, practically all new paving is done by special assessment and comes under the jurisdiction of the Board of Local Improvements. There are three methods by which proceedings can be begun for any particular piece of work. The most common method is by order of the city council, tho many projects are started by petition of the property owners affected. Occasionally work is ordered by the Board of Local Improvements itself.

In case of a petition, it is first referred to the engineer of the Board of Local Improvements, who reports on the project, whereupon the board either abandons it or orders an estimate. In the latter case the engineer makes the estimate, ascertaining the probable cost, and then the property owners are notified of a public hearing, at which they can adopt, change or abandon the improvement, tho, technically, the Board of Local Improvements has the final say in the matter. If adopted, the board then drafts an ordinance, which must be quite complete, naming, not only the location and extent of the project, but also a great deal of the regular pavement specifications as drawn up by the engineer. The city council must either pass or reject this complete ordinance, but cannot amend it.

After the ordinance is passed there are several more formalities to go thru with, including a hearing on the case before a court of record, but finally the specifications are drawn up, the work is advertised and contract is let to the lowest responsible bidder. In alley work each block of alley requires a separate petition, ordinance and contract; in other words,

PROTECTION BAR *for concrete alley pavement with felt filler attached, ready to be installed. Note angle form and tongues sheared from web to project into concrete when laid. These slits permit bending of bar to fit the profile of street or alley.*



JOINT PROTECTION BAR *being placed in concrete alley.*

even tho it were desired to improve one continuous mile of a certain alley, the work would be split up into as many jobs as there were sections of the alley separated by the cross streets.

In the residence districts, tho there are many sections of brick, stone and wood block alley pavements, a good share of the work is now of concrete, owing largely to its moderate cost. For the last few years this has ranged between $1.50 and $2.00 per square yard. The following table shows the growth in yardage of concrete alleys laid in Chicago each year since 1911:

Year	Yardage Laid
1911	8,353
1912	31,111
1913	66,653
1914	69,942
Total	176,059

Specifications for these alleys call for concrete of a 1:2:3 mix, laid with a uniform thickness of 7 inches. The usual aggregates are "torpedo" sand and gravel ranging from ½ inch to 1 inch in size. Occasionally crushed limestone is used instead of gravel. All alleys are dished towards the center; for those of the ordinary widths of between 12 and 18 feet, the center is uniformly 3 inches lower than the sides, and for greater widths 4 inches is commonly specified. Joints are steel protected and spaced 35 feet apart.

Tho there are many contractors in Chicago who specialize in concrete alley paving, each with his own methods of carrying on the work, conditions are all so similar that a description of one job is representative of practically all. The alley where the accompanying construction pictures were taken is bounded by Indiana and Prairie avenues and Fiftieth and Fifty-first streets, about 5½ miles south of the "loop" district of Chicago.

The aggregates were hauled in wagons and the cement on a motor truck, to the site of the work and deposited on the south side of Fiftieth street adjacent to the end of the alley. Concreting was begun at the Firty-first street end; so, from the storage piles the materials were hauled in small, one-horse dump wagons over the subgrade to the mixer. Each dump wagon was fitted with a partition placed so as to divide it into two compartments, the smaller, holding the sand, being two-thirds the size of the larger.

Four cubic feet of sand and 6 cubic feet of gravel were shoveled into each wagon, measurement being made by the height to which the compartments were filled. Then, after adding two bags of cement, the wagon proceeded down the alley to the mixer.

The mixer used on this job was a Koehring paving mixer with a capacity of 18 cubic feet of unmixed material per batch and equipped with a chute of adjustable length. The concrete was mixed and placed in the usual manner with this equipment, and struck off with a templet resting on the side forms and curved to the required section of the pavement.

The feature of particular interest in this year's alley work is the use of a new type of joint protection plate put out for the first time last spring by the Universal Concrete Bar Company, Chicago. This plate, or more properly bar, differs radically in theory and design from the older and more common types. As shown in the drawing and illustrations, it consists simply of an angle with lugs sheared out of the vertical leg and bent back about 59 deg. These lugs are spaced 6 inches, center to center, and are V-shaped, giving a good anchorage in the concrete. The angles are 2½x1½x3/16 inches in size and are made of soft steel, in order to wear down under traffic at the same rate as the concrete. Only one bar is used to a joint.

In placing these bars in the alley work described, a strip of ¼-inch prepared felt 7 inches wide was first wired to the inner side of the vertical leg, tho a better method would have been to paint the inner faces of the angle with hot tar and make the felt adhere to the vertical leg by pressing the two firmly together. Next, five stakes were driven in the subgrade in a straight line across the alley, their tops being brought to the proper elevation to form a vertical curve parallel to the dish of the alley and the thickness of the angle leg below the finished grade. Laid on these stakes, the protection bar is in final position, and the concrete is deposited on both sides and finished in the usual manner.

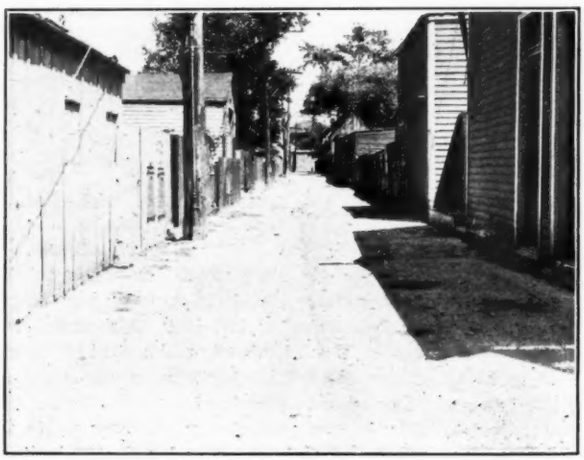
No curving of the bar is required to make it fit the dished cross-section; as, with the lugs sheared out, it is sufficiently flexible in a vertical direction to bend down, fitting the stakes of its own weight. Horizontally, however, it is rigid and so maintains a straight line across the alley.

Referring to the photographs, it is seen that as the vertical leg of the bar is bonded to one slab of concrete and the horizontal leg projects out over the adjacent slab, it is a difficult matter for dirt to penetrate the joint. Painting the inner faces of the bar with tar would render the joint still more impervious, but, as stated, this is not done at the present time in alley work.

M. J. Faherty is president of the Board of Local Improvements of Chicago, and John B. Hittell and Julius Gabelman are chief and assistant engineers.

STANLEY E. BATES,
Chicago, Ill.

FINISHED CONCRETE ALLEY *showing the character of such construction in Chicago.*



MOTOR VEHICLES

Efficiency of the Chemical Engine

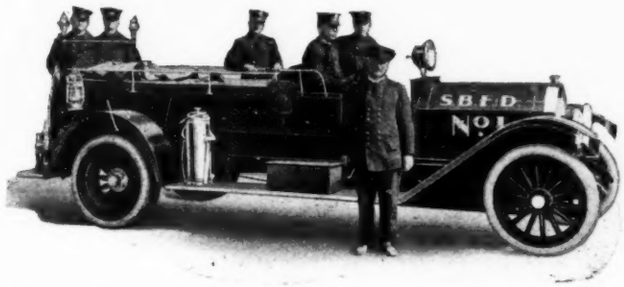
By Irving W. Sibrel, Chief of Fire Department, South Bend, Ind.

The increased efficiency of our department has been due almost entirely to the addition of motor apparatus, viz., one chief's car, one double-tank 70-gallon chemical engine, one city service truck and four hose wagons. For the coming year, I have strongly recommended the purchase of a 75-foot auto aerial truck, as well as a gasoline pumping engine for use in the outlying districts where the water mains are small, and hydrants are few. This condition means the laying of long lines of hose, thus greatly reducing the water pressure, and sometimes means the entire destruction of buildings in these districts. This pump will also be used to a very great advantage in the downtown district. Any one of the several types of pumps are capable of throwing a 1½ to 1¾-inch stream from the ground on top of any of our high buildings.

DURABLE CHASSIS REQUISITE.

Our experience dictates that no matter how fine and complete your fire-fighting equipment may be, it is the chassis that carries it and that chassis can be none too durable. It should not, however, be heavier than necessary to secure the maximum strength.

Motor fire apparatus is subjected to more stresses and strains, more shocks and poundings than any other type of motor-driven machinery. It must "stand up" under rapid driving around street corners and over grade crossings and uneven pavements, or the entire outfit will unexpectedly land in a junk heap at some critical moment. Fire equipment "weighs up" and springs must be sufficiently wide and long enough to absorb and cushion jars and shocks; otherwise the department must stand the up-keep on early crystallization and depreciation. I mention these points to emphasize the fact that a pleasure car chassis will not meet the needs of the modern fire department, particularly when the department lacks a sufficient quota of motorized pieces and must make practically every fire with the motor apparatus they do have in service.



MAKE EVERY FIRE IN CITY.

We have in service at headquarters a South Bend motor chemical engine which answers all stills and boxes thruout the city and puts out 80 per cent of the fires. This machine, as a rule, is busy at the fire before the horse-drawn hose has coupled up. Aside from its efficiency in killing fires in their incipiency, it does away with mammoth water losses and gingers up the entire department. Outside companies do their best to beat the chemical—the chemical crew is a picked one and they have a record to sustain—thus the efficiency of the entire department is raised.

DEPARTMENT RECORDS.

During March, 1915, the above machine answered 57 alarms and 49 alarms in April, 1915. Fully 80 per cent of these fires were roof fires which we could have extinguished with a 30-gallon tank, thus rendering it unnecessary to open up the larger tanks. A chemical engine with two 50-gallon tanks and one 30-gallon tank would be ideally equipped in instances above referred to.

The record of runs for 1914 shows that the chemical made the maximum as follows.

COMPANY	No. Runs	No. Miles Traveled	No. Feet Hose Laid	No. Gallons Chem. Used	No. Feet Lad'rs Raised
No. 1.....	178	326½	396,000	36	400
No. 2.....	86	141¾	18,500	90	521
No. 3.....	113	165¾	15,200	30	156
No. 4.....	94	110½	18,550	54	116
No. 5.....	112	205½	16,500	12	194
No. 6.....	78	121	13,050	96	126
No. 7.....	101	200½	5,450	24	24
No. 8.....	51	98½	9,650	6	408
No. 10.....	53	85	11,300	54	224
Truck No. 1....	130	175½	0	9	2,827
Truck No. 2....	176	495½	5,000	1,100	2,932
Chemical	210	496	21,000	26,949	454
Totals 1,382		2,622	530,200	28,450	8,382

BOTH TANKS INTO SAME LINE.

This machine, which was made by the South Bend Motor Car Works, carries two 70-gallon chemical tanks; both tanks may be thrown into the same line when desired; speed, 10 to 60 miles per hour; wheel base, 152 inches; wheels, artillery type, made of wood; ignition, Bosch; starting, Bosch 2-unit system, starting from flywheel; gasoline capacity, 25 gallons; lighting system, two 10-inch electric headlights, one 10-inch electric searchlight, one electric taillight; chemical tanks; chemical hose, two lines of 200 feet each; acid receptacles, 4;

acid receptacle holders, 2; extinguishers, two 3-gallon Babcock fire-department standard; alarm devices, one locomotive bell and one hand-operated siren horn; ladders, one 20-foot extension ladder, one 12-foot roof ladder with folding hooks; lanterns, two fire department standard; axe, 1; crowbar, 1, of steel, securely held by snaps; pike pole, 1; tool box, 1; tools, 1 complete set, including all necessary tire tools; battery box, 1; carrying capacity, 5 men.

The Storage-Battery-Drive Tractor

By George Boughner, Battalion Chief, Grand Rapids, Mich.

Our 85-foot aerial ladder truck No. 4, weighing twelve tons, which was formerly horse-drawn, was motorized by means of a Couple-Gear four-wheel drive and storage battery-driven tractor on December 31, 1912. Since that time this truck has covered a territory of from 4 to 12 per cent grades. Speed ranges up to 25 miles per hour on ordinary grades, while we recorded a speed of 7¾ miles per hour on a 12 per cent grade in extreme winter weather. Battery is 17-plate, 80-cells U. S. L.

	Years service.	Drive.	H.-P. per wheel.	Miles traveled last year.	Alarms answered last year.	Feet hose.	Feet ladder.
American-LaFrance aerial truck, No. 4, pulled by couple-gear tractor	2½	Elec.	3	149	79	....	2,830
City service truck No. 5, pulled by couple-gear two-wheel tractor	1	Elec.	3	293	79	....	1,715
City service truck No. 7, pulled by couple-gear two-wheel tractor	...	Elec.	3	238	130	....	2,048
City service truck No. 8, pulled by couple-gear two-wheel tractor	2	Elec.	3	204½	114	....	3,416
Seagrave aerial No. 1, pulled by couple-gear tractor	1	Elec.	3	107½	108	....	1,950
Nott fire engine No. 1, pulled by couple-gear tractor	1½	Elec.	3	128	103	....	....

The connection between the tractor and the aerial truck consists of a universal coupling made up of two 30-inch plates resting upon trunnion bars in transverse position; one trunnion attached to the tractor frame, the other trunnion attached to the converted frame, the connection between the two plates being completed by means of plug and linch pin.

COST OF OPERATION.

The following cost of operation for the first year was greater than for either of the succeeding two years on account of the fact that the driver had had no previous experience in battery charging:

Period of time from Jan. 1, 1913, to Jan. 1, 1914—

Cost of repairs, including labor and material	$ 0.00
Cost of lubricating oil and grease	1.00
Cost of electricity (2900 k.w. at 4c)	116.00
Cost of distilled water (50 gallons)	5.00
Total cost	$122.00
Distance traveled, 303 miles. Cost per mile	.40
Cost of (3) horse-drawn apparatus (same equipment) and traveling same distance for same period	$438.00
Cost of horse-drawn apparatus per mile	1.44
Saving effected over horse-drawn (same period)	316.00
Saving effected over horse-drawn (per mile)	1.04

SAVING OF DRIVER'S SALARY.

The drivers look after the charging and filling of the batteries with distilled water, and such little attentions as the apparatus requires, filling grease cups, oiling the motors, wiping the brushes and commutators. The drivers in charge of this apparatus never had any previous experience with electricity or operating automobiles of any kind. They were instructed by the demonstrator who came with the tractor, and since that time have practically handled the apparatus on their own responsibility. Their experience has resulted in a considerably reduced cost of operation over the first year. Altho this department was among the first to so motorize its horse-drawn equipment, we have experienced no trouble, and the initial installation has never been out of commission. Aside from the saving over horse-drawn apparatus, as noted above, there should also be included salary of team driver as well as added assistance of tractor driver in actual fire-fighting, in view of the fact that a team driver must watch his horses at all fires.

FIVE ADDITIONAL INSTALLATIONS.

As noted, during the first year's service, January, 1913, to January, 1914, this outfit answered 300 alarms, traveling 303 miles, at a cost of 40 cents per mile, or a saving of $1.04 per mile over horse-drawn apparatus traveling the same distance for a like period. Our experience, therefore, has been so satisfactory that we now have six other pieces of similar type. The following table gives year's service and terse details of each for the past twelve months:

The Monthly Report Sheet

Gives Accurate Accounting of Repairs, Runs and Miscellaneous Maintenance Costs of Motor Fire Apparatus

By John A. Welsh, Battalion Chief of Fire Department, Columbus, Ohio.

We keep a very accurate record of maintenance expense on all our motor apparatus. Our monthly report sheets are made up from the daily sheets. We can, at any time, immediately turn to any given piece of apparatus and ascertain exact maintenance expense for any given period, as illustrated in Fig. 1. Reverse side of form is illustrated by Fig. 2.

The maintenance expense on Seagrave tractor No. 1 for month ending December 31st, 1914, is given as example herewith for the reason that this machine met with a collision accident during the month and thus better illustrates our method of recording such facts.

It will be noted that this monthly record gives an accounting of repairs, painting, tire expense, accessories, batteries, garage, miscellaneous, runs (both in and out), time of service, gallons and cost of gasoline and oil and mileage, with driver's signature for each day of the month. Any of these items may be cross-checked at any time by reference to the daily report blanks bearing proper signatures.

It is not only requisite that we should know the total monthly number of runs and hours of service of each piece of apparatus if we are to judge service by upkeep, but that we should have on the same form the different items included in the total maintenance cost.

KEEPING DOWN MAINTENANCE COSTS

We are then in a position to tell at a glance whether certain costs are greater than they should be. Comparison of

Necessary Particulars Covering Tires, Tubes, Etc., Bought, Repaired or Discarded; Details Regarding Miscellaneous Equipment or Parts Purchased; and Information With Respect to Accidents, Battery Troubles, Etc., Should Be Reported Fully Yet Concisely Hereinunder.

TIRES AND OTHER EQUIPMENT PURCHASED

DON'T FAIL TO FILL IN DATA ON TIRES PURCHASED AS FOLLOWS:

MAKE AND STYLE OF TIRE Goodrich Solid
SERIAL NO. ... PURCHASED Nov 1913 REMOVED ...
REMOUNTED ... DISCARDED ... MILEAGE 825
GUARANTEE ...

MAKE AND STYLE OF TIRE Goodrich Solid
SERIAL NO. ... PURCHASED Nov 1913 REMOVED ...
REMOUNTED ... DISCARDED ... MILEAGE 825
GUARANTEE ...

MAKE AND STYLE OF TIRE Goodrich Dual Solid
SERIAL NO. ... PURCHASED Nov 1913 REMOVED June 1, 1914
REMOUNTED ... DISCARDED June 1 1914 MILEAGE 563½
GUARANTEE ...

MAKE AND STYLE OF TIRE Goodrich Dual Solid
SERIAL NO. ... PURCHASED Nov. 1913 REMOVED June 1, 1914
REMOUNTED ... DISCARDED June 1, 1914 MILEAGE 563½
GUARANTEE ...

OTHER EQUIPMENT PURCHASED:—

REMARKS:—

FACTS REGARDING ACCIDENTS, OR BATTERIES

While responding to Box 271 at 9.00 A. M. Dec. 4. 1914. Hook-Ladder Tractor No 1. collided with a street cleaning wagon owned by the city at Long & Front Sts. The steering gear of the tractor was broken by collision

Witnesses to accident

Chas J. Lauer No 33½ W. Long St
Chas Bowerman No 11. N. Front St
John Sikes Cor Gay & Front Sts

RECEIVED AT OFFICE January 1st 1915 ENTERED BY S.E. Rodgers SIGNATURE J.A. Welsh BATTALION CHIEF IN CHARGE

Hook-Ladder Co No 1.

MAINTENANCE EXPENSE ON AUTOMOBILE NO. 1. TRACTOR. FOR MONTH ENDING December 31 1914. FOR ...

DATE	REPAIRS	PAINTING ETC.	TIRE EXPENSE	ACCESSORIES	BATTERIES	GARAGE	MISC'L	RUNS OUT	RUNS IN	IN SERVICE	IN SHOP	GAS GALS.	GAS COST	OIL QTS.	OIL COST	MILEAGE	TOTAL COST	DRIVER'S SIGNATURE
1				40				10.45 P.m.	12.00 P.m.	25 m.		10	1 40			1	1 50	1 Thos Pirt
2								7.30 A.m.	7.45 A.m.	30 "						1½		2 " "
3					10			6.40 " "	7.00 " "	20 "						½	10	3 " "
4	2 00							9.00 P.m.	9.60 P.m.	60 "	2 hr.			2	26	1½	2 25	4 " "
5								3.30 A.m.	4.00 A.m.	40 "						¾		5 Wm Strickfadden
6								5.00 " "	8.00 " "	40 "						2		6 " "
7				18													18	7 " "
8								11.30 A.m.	1.00 P.m.	1.40 "		10	1 40			1½	1 68	8 Thos Pirt
9								4.30 P.m.	4.60 P.m.	20 "						½		9 " "
10																		10 " "
11																		11 " "
12								7.10 P.m.	7.40 P.m.	30 "						1		12 Wm Strickfadden
13																		13 " "
14				1 50				8.00 P.m.	10.40 P.m.	2.40 "						2½	1 50	14 Thos Pirt
15								1.30 A.m.	7.00 A.m.	30 "		10	1 40			¾	1 60	15 " "
16								11.00 " "	11.00 " "	40 "						1½		16 " "
17																		17 " "
18								7.30 P.m.	7.45 P.m.	15 "				2	26			18 Wm Strickfadden
19								8.15 A.m.	9.00 A.m.	45 "						¾		19 Thos Pirt
20								9.00 P.m.	9.30 P.m.	30 "						⅓		20 " "
21								11.30 P.m.	12.00 A.m.	40 m.						¼		21 " "
22								4.30 A.m.	5.00 A.m.	40 "								22 " "
23												10	1 40				1 40	23 Wm Strickfadden
24								7.10 A.m.	8.00 A.m.	50 "						½		24 Thos Pirt
25								9.00 A.m.	9.30 A.m.	30 "						1½		25 Wm Strickfadden
26								1.30 P.m.	1.50 P.m.	20 "						⅓		26 Thos Pirt
27				25				2.40 P.m.	3.30 P.m.	50 "						2½		27 " "
28								9.00 A.m.	9.50 A.m.	50 "						2		28 " "
29								10.30 A.m.	11.15 A.m.	45 "		5	70	1	12½	1½		29 " "
30																		30 Wm Strickfadden
31								2.15 P.m.	5.00 P.m.	2.45 "						½		31 " "
TOTAL	2 00			$2 33	10			24 RUNS		696 m.		45	$6 30	5		47½	25¾ m. $10 21	

DETAILS REGARDING ACCIDENTS, PURCHASES OF TIRES OR ITEMS OF MISCELLANEOUS UPKEEP MAY BE GIVEN AT BACK HEREOF

BENNETT PRINTING CO. COLUMBUS, OHIO

number of runs and hours' service of any piece of apparatus with similar records for previous months is interesting when comparing maintenance costs. As stated, all of this information being contained on monthly sheets makes cross comparisons easy and intelligible. We can tell at a glance just where we stand. We quickly discover any overcharge on any item and the same sheet which gives us this information also gives us the name of the man in error. We are thus in a position not only to correct any leakage due to carelessness, but to keep total costs down to a minimum. It would be an exceedingly difficult matter to accomplish this desired result were we not in a position to tell where the small amounts go.

Tractor One, furnished us by the Seagrave Company, Columbus, O., has been in service a little over 2½ years. It is a six-cylinder Type "D," 80-h.p. machine and identical with five other tractors of same make now in service in this department. The gear on this type is the combined worm and nut type with extra large bearing surfaces; suitable means being provided for all necessary adjustments.

The gear shift is so arranged with gear lever that only one set of gears can be engaged at a time, all other gears being automatically locked at that time. When in neutral position all gears are locked. The gear shift lock is extremely simple, there being no springs used in its construction to weaken or break.

The springs, which are specially designed, are very easy riding. The three top leaves are made of vanadium spring steel; balance of leaves are of alloy steel. All spring bolts are hardened and ground and provided with compression grease cups. The front springs are semi-elliptic, 40 inches long by 2¼ inches wide. Rear platform (three point suspension) 42 inches long, 2½ inches wide. Plates are lipped and edges clipped of suitable size for load carried.

A suitable rocker plate or equalizer made of channel steel and thoroly braced, carrying fifth wheel, is placed at rear of chassis or tractor frame, mounted on journal boxes. This rocker plate is so constructed as to take the front end of aerial truck or steam fire engine and so it can be quickly detached when necessary. This rocker plate oscillates on its bearings in such a manner so to allow the truck or engine to be driven over crowded roads or up hills and over street inequalities without putting any undue strain on frame of either tractor or truck.

The driving sprockets, which are interchangeable, are of one-piece steel, keyed and clamped by nuts to jack shaft, and with jack shaft may be readily removed. These sprockets are mounted on Hess-Bright bearings. The rear sprockets, which are made of cast steel, are cast integral with emergency brake drum and are bolted to rear wheels.

There are five brakes on this type of tractor; two are external contracting bands lined with non-heating fabric, operating on drums attached to differential (sprocket) shaft, operated by pedal lever and when in operation brake directly to rear wheels thru sprockets and chains, taking all strain off the transmission bevel-driven and differential gears.

During the past twelve months, our tractor No. 1, attached to hook and ladder No. 1, traveled 212 miles in answer to 177 alarms. In our opinion this type of tractor is a most economical solution of the horse-drawn problem. It effects desired motorization at the same time permitting of use of good equipment. Scores of municipalities have good money tied up in horse-drawn equipment. In many instances this equipment is in as good condition as when purchased, lacking only in speed. The semi-trailer tractor efficiently solves the problem at a considerable saving in cost of operation and maintenance. This type of tractor, above described, carries part of the load on the driving wheels and part behind on the trailing wheels. These tractors, built specially for the work, with short wheel-base, short turning radius, extra low gear, and other desirable features, motorize horse-drawn steamers and hook and ladder trucks in a highly efficient manner.

Fire Department Notes

William H. Murphy, chief engineer of the fire department of Philadelphia, Pa., has been actively connected with the Philadelphia Fire Department since 1895, when he was appointed a hoseman. He received a promotion to the rank of lieutenant on March 16, 1900; was raised to captain on January 1, 1907, to battalion chief on July 12, 1911, and finally to chief engineer on January 27, 1914. The Philadelphia department now has thirty pieces of motor-driven apparatus in service and 146,000 feet of hose. There were 4,762 alarms last year. The marked improvement in the Philadelphia Fire Department during the past year has been largely the result of Chief Engineer Murphy's unremitting personal efforts. It is his present desire to motorize the entire bureau as soon as possible.

P. J. Monaghan, chief of fire department of Shenandoah, Pa., has introduced a new fire prevention code, which has reduced the number of fire alarms since January 1, 1915, to fourteen, a reduction of more than 50%. The total fire loss in his city since January 1, 1915, amounts to $337 on buildings and $70 on contents. Shenandoah is a city of 28,000 and the department has one piece of motor-driven apparatus.

P. E. Bell, the new chief of the fire department of Fayetteville, Tenn., has been in the service of the department for more than five years. Since succeeding former Chief Eslick in March, 1915, Mr. Bell has succeeded in materially increasing his fire fighting equipment. The department is at present horse drawn.

G. H. Hornblin, chief of fire department, Sherman, Texas, became a member of the fire department in 1893. His first position was that of driver of a hose cart. In 1903 he was appointed captain, in which capacity he served for ten years. In 1913 he received his appointment as chief of the fire department. During twenty-two years of service he has missed only four days. His department has in service several pieces of horse-drawn equipment and one auto pumper and hose wagon. The introduction of auto equipment has reduced their fire losses.

Will McLaughlin, chief of fire department of Watertown, S. D., has been a fire fighter since 1888, when the department of Watertown was organized.

I. N. Barnett, recorder, Rockwood, Tenn., writes that the city contemplates the purchase of a chemical engine and auto truck. W. M. Thompson is fire chief and the fire committee consists of the following: J. M. Sivils, chairman, A. H. Doescher, G. Odom.

During 1914 there were twenty-six fires in the boro of Latrobe, Pa., with total fire losses amounting to $1,956.85. John L. Ackerman is chief engineer.

MISCELLANEOUS

Cincinnati Convention of the International Association of Fire Engineers

The Cincinnati convention, which was the forty-third of the International Association of Fire Engineers, began on schedule time by President H. R. Delf of Lansing, Mich., on Tuesday morning, August 31, with the usual welcoming addresses and responses, which were completed in time to allow the discussion of progress in electric fire alarm systems by W. H. Flandreau, superintendent of the Mt. Vernon, N. Y., fire alarm system.

The afternoon of Tuesday was occupied by the discussion of sprinkler systems. Chief W. H. Murphy of Philadelphia adovated sprinklers, but in line with Chief Swingley of St. Louis, whose paper was read in his absence, Chief John Kenlon of New York, did not consider them infallible. The last-named speaker asked whether universal installation of sprinklers would do away with fire departments, thus concentrating attention and driving home his point. Chief Ringer of Minneapolis asked concerning the efficiency of sprinklers charged with carbonic acid and difficulties with stoppage of pipes and overcoming of firemen were mentioned. Dry pipe systems were condemned by J. C. McDonnell of Chicago bureau of fire prevention. Resolutions were adopted advocating installation of sprinkler systems and appointing a committee to investigate systems and methods of installing them. Chiefs T. O. Doane, Plainfield, N. J.; H. L. Stanton, Norwich, Conn.; A. B. Ten-Eyck, Hamilton, O.; F. E. Henderson, St. Louis, were among the speakers.

Fire prevention was the next subject and, in fact, was the principal subject of the entire convention. Franklin H. Wentworth told of the work of the National Fire Protective Association. Storage and handling of nitric acid was discussed by Chief T. A. Clancy of Milwaukee. J. E. Latta described the laboratory work of the National Board of the Fire Underwriters' Association. J. C. McDonnell, chief of the Chicago Bureau of Public Safety, told his experience in fire prevention work.

A valuable paper on the manufacture, selection and care of rubber tires for fire apparatus, by A. H. Leavitt of the B. F. Goodrich Co., was presented.

On Thursday morning the report of the committee on fire prevention was made by Chief Kenlon and the proper installation of a fire prevention bureau under the chief of the fire department in each city was thoroly considered.

Traction and non-skid devices for motor-driven fire apparatus were discussed in papers by Chiefs James Smart, Calgary, Alberta, and Olaf Johnson, Superior, Wis.

Private fire brigades were described in papers by the fire marshals of Harrison Bros. & Co. chemical works, Philadelphia, and Sears-Roebuck Co., Chicago.

The day of action was Wednesday, devoted to the annual official testing of motor-pumping apparatus and to sightseeing. The full report of the test cannot be given here, some nine engines of four makers were reported upon.

The registration of members was more than 500 and more than 1,200 were in attendance. The exhibits were unusually large, the proceeds for space at 10 cents a square foot occupied amounting to over $1,500.

Providence, R. I., was selected as the next place of meeting and the officers elected were: President, Harry L. Marston, Brockton, Mass.; vice president, Thomas A. Clancy, Milwaukee, Wis.; vice president, A. A. Rozetta, Nashville, Tenn; secretary, James McFall, Roanoke, Va.; treasurer, George Knofflock, Mansfield, O.

Technical Associations

The Engineers' Club of Dayton, O., is an unique institution in that it is the only engineers' club outside the largest cities which maintains a house of its own with all the conveniences of a social and a technical club. It has 160 members and is now building up a strong technical library. A dining room, tennis courts and reading room give opportunity for exercise of the preferences of all members. The club has full charge of the entertainment of the ladies accompanying the members of the American Society of Muncipal Improvements to their convention in Dayton, Oct. 11 to 15, and has arranged a very attractive program for them.

The Colorado Association of Members of the American Society of Civil Engineers has issued its report for last year and its list of members, 79 in all. Its September meeting was passed by to enable the association to join in the entertainment of the parent association and other engineers en route to the San Francisco Engineering Congress.

The American Association of Engineers, 29 South LaSalle street, Chicago, Ill., has been organized to raise the standard of ethics of the engineering profession and to promote the economic and social welfare of engineers. It has held fortnightly luncheons and had increased to more than 100 members at the date of a booster dinner held at the LaSalle hotel, Sept. 14, at which F. H. Newell, the new head of the civil engineering department of the University of Illinois, delivered an address entitled, "The Engineer Awakes;" Garrison Babcock, on "The Working Engineer;" E. A. Woodward, on "Civic Military Organization," and Secretary Arthur Kneisel, on "Food for Thought and Action." The first annual convention will be held at the Hotel LaSalle, Chicago, Dec. 10 and 11, to which engineering societies and clubs are invited to send delegates.

Calendar of Association Meetings

American Builders' Week will be celebrated in San Francisco, Oct. 18 to 23, under the auspices of the entire building industry of San Francisco.

The American Forestry Association and the National Brick Manufacturers' Association meet in San Francisco Oct. 20.

The National Paving Brick Manufacturers' Association will meet in Dayton, O., Oct. 11 and 12. Will P. Blair, secretary, B. L. E. building, Cleveland, O.

The American Society of Municipal Improvements will meet in Dayton, O., Oct. 12 to 15, with important public committee meetings on Oct. 11. Charles Carroll Brown, secretary, 702 Wulsin building, Indianapolis, Ind.

The National Municipal League will meet in Dayton, O., Nov. 17 to 19. Clinton Rogers Woodruff, secretary, 705 North American building, Philadelphia, Pa.

The Alabama Good Roads Association will meet in Birmingham, Oct. 12-13. J. A. Rountree, secretary, Birmingham, Ala.

The Southern Appalachian Good Roads Association will meet in Bluefield, W. Va., Oct. 14-16. C. B. Scott, secretary, Richmond, Va.

The National Conference on Concrete Road Building will be held in Chicago Feb. 15 to 18, 1916. J. P. Beck, secretary, 208 South LaSalle street, Chicago, Ill.

The Cement Products Exhibition Co. will hold its next show Feb. 12 to 19, 1916. Robert F. Hall, secretary, 208 South LaSalle street, Chicago, Ill.

The Pennsylvania State Firemen's Association will meet in Philadelphia Oct. 5 to 8. M. S. Humphreys, president, Pittsburgh, Pa.

The Atlantic Deeper Waterways Association will meet in Savannah, Ga., Nov. 9 to 12.

The National Commercial Gas Association will meet in Washington, D. C., Nov. 27 to Dec. 3.

Technical Schools

The annual report of the training school for public service conducted by the Bureau of Municipal Research 261 Broadway, New York, states the purposes of the school, the present opportunities in public service, terms of admission, program of instruction and methods of conducting the work of the school.

Columbia University has raised its courses leading to the degree of chemical engineer to the dignity of a separate department of chemical engineering under Prof. M. C. Whitaker.

The Commerce Bulletin of the New York University School of Commerce, Accounts and Finance, dated July 27, gives a preliminary announcement of courses for commercial teachers.

The new catalog of the Wentworth Institute, Boston, Mass., announces two new courses, one being a trade preparatory course to test the directions in the manufacturing industries in which young men show special skill and ability before they begin work. The course in architectural construction has also been extended.

Civil Service Examinations

The State of Illinois has created a sanitary engineering bureau of the State Board of Health.

The salaries, duties and necessary qualifications for the engineering positions at present contemplated are stated as follows by Dr. C. St. Clair Drake, secretary of the board.

Chief Sanitary Engineer: Salary, $250 to $500 per month. Minimum age, 30 years. Sex, male. Duties will involve: Under the direction of the executive officer of the State Board of Health, responsible charge of the sanitary engineering bureau of said board, which will include examinations of projects for water supply, sewage, garbage and other wastes disposals, city and rural; drainage; investigation of sanitary conditions of cities and rural communities, buildings, summer resorts, fair grounds, amusement parks, construction camps, railroad properties, shipping warehouses, cold storage plants, rendering plants, stock yards, factories, schools, etc.; examination and approval of plans for plumbing, ventilation, heating and lighting of public buildings and public houses; furnishing information, counsel and advice to state, city, county and township authorities on matters which lend themselves to engineering treatment, and such other duties as might properly be expected of a sanitary engineering service.

Experience and Training: Graduation from a reputable engineering school in either a sanitary, municipal or civil engineering course and at least five years' responsible charge of sanitary engineering work. Preference to be given to applicants having previous experience in state board of health work or along similar lines and to applicants having familiarity with the state of Illinois.

The examination, which should be of unassembled type followed by oral quiz, and which in addition to the usual questions relating to age, education, previous and present conditions of employment, should embrace questions relating to the following: Experience in supervision of other employes; reports and other publications; experience as expert witness; knowledge of water supplies, sewerage and sanitary conditions in Illinois; experience in reviewing plans for water purification, sewage treatment, and city cleaning projects; experience in design and construction of water purification and sewage treatment projects; and, possibly membership in engineering and technical societies.

Assistant Sanitary Engineer: Salary $100 to $250 per month. Minimum age, 25 years. Male. Duties will involve work as assistant in sanitary engineering bureau of the State Board of Health and will include examinations of water supplies, sewerage systems and city cleaning methods; chemical and bacteriological analyses; sanitary survey of municipalities; sanitary inspection of public buildings, public houses and places; investigations relating to water purification, sewage disposal, wastes disposal, air conditioning; investigation of water-borne diseases, etc.

Training and Experience Required: Graduation from a reputable institution in civil, sanitary or municipal engineering and at least two years' experience in State Board of Health work, or along similar lines.

In order to fill the position of chief sanitary engineer, the Illinois State Civil Service Commission has arranged with the Board of Health to hold an examination early in November, and applications will be received up to October 30, 1915. This position has been thrown open to non-residents of Illinois. The inquiry will be unassembled and not of the usual written type. Applicants will be asked to forward complete statements of their qualifications and experience. Their statements will be verified where necessary and those who are considered qualified for the position will be called to Illinois for a personal interview. This method will recommend itself to busy men as it follows the methods ordinarily used by private concerns in selecting employes.

W. R. Robinson, 904, 130 North Fifth avenue, Chicago, Ill., is secretary of the State Civil Service Commission.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

Oct. 13, 14: Ship draftsman in Bureau of Construction and Repair, Navy Department, Washington, New York and Pensacola, at $3.28 to $4.48 a day, with promotions to higher salaries.

Personal Notes

Mr. Franklin Henshaw has been appointed street commissioner of the village of Scarsdale, N. Y. The village is expending a considerable amount of money this fall on the improvement and repair of the streets and expects by next year to be able to develop a comprehensive system for the care of its 26 miles of improved highways and the development of new roads.

E. J. Hernan, assistant director general of the National Highways Association, has been doing excellent service lately on the Southern National Highway in co-operation with the Texas Good Roads Association in securing additional mileage of good roads in the southern counties of that state.

Frank Koester, consulting engineer and city planning expert, New York, has been retained by the Allentown City Planning Commission to prepare plans and specifications for the systematic and economical development of Allentown, Pa., a city of 62,000 inhabitants. These plans are to cover the entire field of city planning from engineers', architects' and landscape designers' standpoint. During his work at Allentown he will give also an exhibition and several illustrated lectures on city planning. Mr. Koester is a technically trained and eminently practical man, who has had long and varied experience in German municipalities and during his thirteen years of professional activity in America, has frequently been called upon as a consulting expert. He is the author of several technical, city planning and sociological works.

Mr. W. E. Hardy, for the past eleven years connected with the Diamond Rubber Company and the B. F. Goodrich Company, and lately in charge of the sales of their mechanical rubber goods division, has lately been appointed sales manager of the Boston Belting Company, Boston, Mass., manufacturers of mechanical rubber goods.

The New York office of the Fibre Conduit Company of Orangeburg, N. Y., is now located at 101 Park avenue, corner Fortieth street, New York City, in quarters three times the size of the former offices.

Publications Received

The Touring Bureau of the American Automobile Association has issued a 4-page leaflet, giving in tabular form the principal automobile regulations and fees in all of the states of the Union.

The State Geological Survey of Illinois, in co-operation with the U. S. Geological Survey, has just issued Bulletin 31, giving the results of their oil investigations during 1914. The Colmar oil field, which was predicted by the survey, is described in detail, and other favorable areas south of the present field are outlined. The Allendale field of Wabash county is treated in another part of the same bulletin, and a newly described anticline in Randolph county will be of interest to the oil man. A large area in Bond, Macoupin and Montgomery counties is described in detail, and several districts are pointed out in which conditions are favorable for oil and gas accumulation. In one of these areas some of the largest gas wells ever known in Illinois have been drilled recently.

A Survey of the Public Health Situation, Ithaca, N. Y., by Franz Schneider, Jr., Ithaca, June, 1915, is a report typical of what may be done in the way of a comparatively rapid survey of the public health situation in a small or moderate sized city. The report contains, however, the results of an original investigation of the number of wells and privies in Ithaca and considerable other material unusual in a survey of this type, material which was obtainable thru the presence of Cornell University. The report is 35 pages in length and is illustrated with 4 maps and 6 photographs.

Conservation of Water by Storage, by George Fillmore Swain, LL. D., Gordon McKay Professor of Civil Engineering, Harvard University, is a book containing the series of Chester S. Lyman lectures delivered by the author at the Sheffield Scientific School, Yale University, and is published by the Yale University Press, New Haven, Conn., at $3.

The Board of Water Supply of the city of New York has issued a 40-page booklet descriptive of the Catskill water supply with maps, cross-sections and photographs, which is a very satisfactory general story of the work.

Dawson's "Municipal Life and Government in Germany," published by Longmans, Green & Co., Fourth avenue and Thirtieth street, New York, was reviewed at some length by us recently. Its studies of the principles of municipal government are well worth reading. The price of the book is $3.75 net.

A "Bibliography of Municipal Government," by William Bennett Munro, Phd., LL.B., professor of municipal government in Harvard University, gives a classified list of the best materials available for study in every branch of municipal affairs. Particular attention is given to official reports and to authoritative articles in scientific periodicals on such matters as water supply, sanitation, public lighting, street railways and so forth. By far the larger part of the references are to publications which have appeared within the last twelve or fifteen years. Great care has been taken to arrange the materials so that they may be easily found, and many of the citations have critical notes. An elaborate author-and-subject index is appended. It is published by the Harvard University Press, Cambridge, Mass., at $2.50.

Facts about all sorts of organizations which bear a vital relation to the business activities of the country are presented in compact form in the directory of "Commercial Organizations of the United States," a new edition of which has been issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce. Dependence was not placed entirely on the information given by trade organizations in response to circulars sent out from Washington, but valuable assistance was afforded by the Postoffice Department, thru the postmasters, who reported upon commercial organizations in their respective sections. The result is the most complete list of organizations directly related to the commercial life of the country that has ever been issued. In the compilation the organizations have been divided into three classes—interstate, national and international in one; state and territorial in the second; strictly local associations in the third. The first class mentioned are listed both alphabetically and by trade classifications, the others are grouped according to the states in which they are located. In addition to data relating to dues, income, number of members and date of annual meeting, the field of service and special activities of the respective local organizations are shown as far as practicable by the use of symbols. Copies of the publication may be obtained at 15 cents each from the Superintendent of Documents, Washington, D. C., or from the branch offices of the Bureau of Foreign and Domestic Commerce.

Daily "Commerce Reports" is a government publication which secures information from 300 consular officials, located in every part of the world, which contains special articles prepared by commercial attaches and agents of the Department of Commerce, stationed at the most important centers of foreign trade, and which gives to the American manufacturer a daily list of firms in foreign countries anxious to buy American goods and represent American manufacturers. It also contains a complete daily record of what the United States government wants to buy or construct. American business men should read it with their morning mail. It furnishes a daily summary of the market conditions and prices of different lines of industry in the world's markets and contains notices of current changes in the tariffs and trade-mark laws of foreign countries. It also gives every morning a list of foreign "Trade Opportunities." The subscription price is $2.50 a year, sent to the Superintendent of Documents, Washington, D. C., or to the nearest branch office of the Bureau of Foreign and Domestic Commerce.

The proceedings of the eleventh annual convention of the American Road Builders' Association, held in Chicago in December, 1914, have been received and can be obtained of E. L. Powers, secretary, 150 Nassau street, New York.

MACHINERY AND SUPPLIES

Strickler Ratchet Pipe Cutter

The Strickler Ratchet Pipe Cutter, as illustrated, automatically cuts cast iron, steel and wrought iron pipe from ¾ inch to 30 inches in diameter by hand. The cutting blades of this machine make a channel cut around the pipe and it is stated that this cutting is done without leaving of burrs and ragged edges. These cutters are to be had in a range of sizes. Each size cuts a wide range of pipe, opens wide, easily centers up and is fastened on the pipe by the tightening of one swing-bolt. The ratchet head which holds the handle is equipped with dogs engaging the teeth on the body of the machine which holds the star-fed cutting blade. As the machine rotates around the pipe, the star feeder sends the cutting tools in automatically and this is accomplished so easily that one man can readily cut 8-inch pipe, while two men have been known to cut 16-inch and 20-inch cast or wrought iron and steel pipe in speedy fashion.

TYING IN *a ten-inch and twelve-inch line with Strickler pipe cutter.*

These cutters are to be had in the following sizes of pipes:

Strickler No. 1, cuts	¾	to	2	inches inclusive.
Strickler No. 2, cuts	1¼	to	4	inches inclusive.
Strickler No. 3, cuts	2½	to	6	inches inclusive.
Strickler No. 4, cuts	4	to	8	inches inclusive.
Strickler No. 5, cuts	8	to	12	inches inclusive.
Strickler No. 6, cuts	12	to	16	inches inclusive.
Strickler No. 7, cuts	16	to	24	inches inclusive.
Strickler No. 8, cuts	24	to	30	inches inclusive.

These ratchet pipe cutters, which are made by W. W. Strickler & Bros., Columbus, Ohio, are in use by National Water Main Cleaning Co., Tampa Water Works, J. G. White Eng. Corpn., Firestone Tire and Rubber Co., United National Gas Co., Oil City, Pa., Dayton Water Works, Dayton, O., Baltimore Co. Water Works, W. Va. Water and Elect. Co., Charleston, W. Va., Public Water Dept., Canandaigua, N. Y., United Fuel Co., Pittsburgh, Pa., Ohio Fuel Supply Co., Columbus, O., American Gas Lt. Co., New York, Water Dept. District Columbia, Con. Gas and Electric Co., Baltimore, Md., and scores of others. These cutters are also very largely used by water and light companies as well as by public contractors specializing in these lines.

Export of Asphalt from Trinidad

The following is from the "Trinidad Prices Current," August 23, 1915, published by The Trinidad Shipping & Trading Co., Ltd., offices 175 West Glasgow, Scotland, Port-of-Spain, Trinidad, and New York. It shows the exports of Trinidad Asphalt from the Island of Trinidad for the period from 1910 to August 21, 1915, inclusive:

1910	94,373 tons
1911	92,891 tons
1912	109,006 tons
1913	144,793 tons
1914	106,388 tons
1915	64,241 tons

New Power Scraper Back-Filler

The illustration shows a new type of power-scraper back-filler and leveller made entirely of steel and with a traction arrangement which permits of movement both forward and backward.

This outfit, which is particularly suited for street excavation as well as the back-filling of trenches, is equipped with a 6-h.p. Novo engine. The clutch used in pulling the cable is of the standard hoisting-engine type. It is also equipped with a

brake for holding the line when raising pipe and also a ratchet and paul which will allow the hoist to be set permanently.

It is fitted with an improved multiple-disc clutch in connection with the traction arrangement. It is fitted with high wheels and wide tires. The line or cable which comes from the scraper to the machine is run through a sheave at this point, which is swiveled and which allows it to turn in any direction and thus allow the operator to work the scraper from any point.

These machines are manufactured by the Oshkosh Mfg. Co., Oshkosh, Wis.

Shovel Excavation in Busy Street

The illustration herewith shows an "18-B" type Bucyrus steam shovel in excavation work for 48-inch cast iron pipe, Staten Island, under the supervision of the board of water supply, city of New York, of which J. Waldo Smith is chief engineer, W. E. Spear is department engineer and J. P. Hogan is division engineer.

A noteworthy feature is that this shovel was operated on a busy thorofare about five feet from curb line and next to street car tracks. In spite of close proximity to trolley poles, overhead wires, trees and a 2,200-foot water pipe line for house and fire service extending along the trench, the shovel averaged 90 linear feet per 8-hour day in disintegrated serpentine, and as high as 105 feet in straight earth or 142 cubic yards and 165 cubic yards per day at a cost of 44 cents per cubic yard.

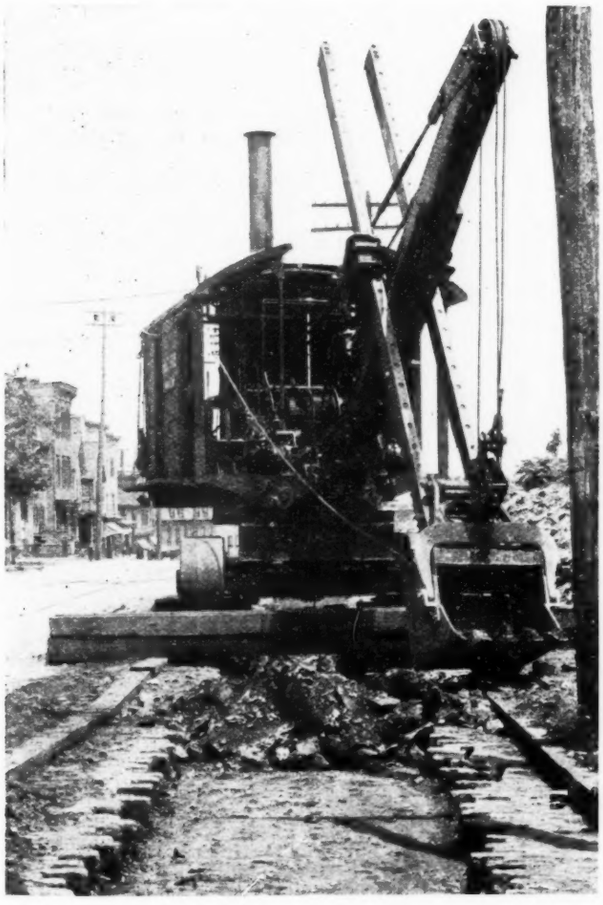
The 4-inch water pipe line was temporarily relaid along the bank so that its service might be maintained until the 48-inch pipe was installed, after which it was replaced in position in trench.

This shovel, equipped with a 7/8-yard dipper, was supported over the cut by means of a platform formed by 8 by 8 timbers 18 feet in length. The average cover over the 48-inch pipe was 4 feet, while the trench was 9 feet in depth.

The 48-inch pipe sections, weighing approximately 5 tons each, were brought to the work on motor trucks and unloaded by means of a 5-ton chain block. One of these motor trucks averaged 14 pipes per day, 105 ton-miles, at a haulage cost of 65 cents per ton or 43 cents per ton-mile.

The excavating contract was completed by the Beaver Engineering & Contracting Co., owners of the shovel above described.

BUCYRUS "18-*B*" *shovel averaging ninety feet per day in rock cut eight feet deep.*

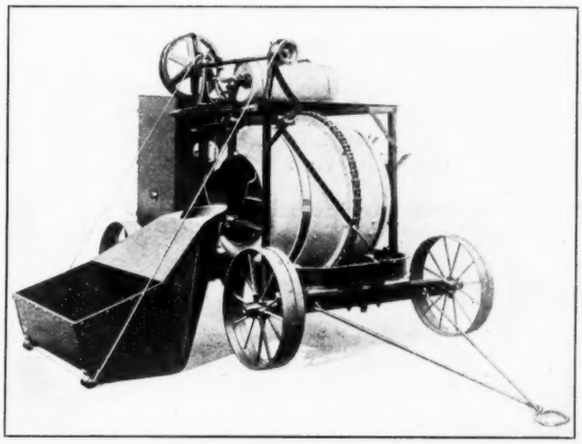


The No. 10 Rex Mixer

The most satisfactory kind of mixer is one that will meet the contractors' needs under the most trying conditions. The No. 10 Rex mixer is a one-bag machine with the low-charging features. This machine can also be equipped with a power loader and automatic water tank if the contractor desires it. The mixer can also be supplied with steam engine and boiler, gasoline engine and electric motor.

Due to this there are few conditions under which a contractor using a mixer could not use a No. 10 Rex mixer to advantage.

The No. 10 Rex has a capacity of 10 cubic feet of unmixed material and will thoroly mix and discharge a batch of concrete in 45 seconds. The charging platform is but 22 inches above the ground, allowing the wheelbarrows to run up an easy incline to charge the mixer drum, which has a 21-inch opening. The discharge chute is of the pivoted type and is high enough above the ground to discharge into wheelbarrows.



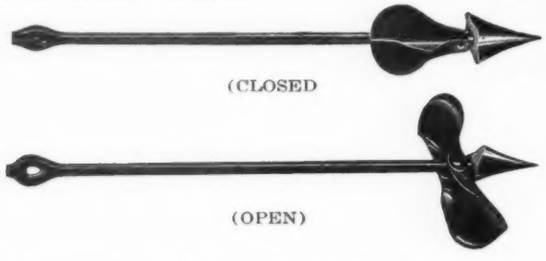
All materials entering into the construction of the Rex mixer are steel or refined semi-steel, the only timber parts being the tongue and the charging platform. The drum is of cast semi-steel made in two sections bolted together in the middle. This drum is exceptionally hard and will outwear several drums that are made of plate steel, it is claimed, for the walls are several times thicker and have no rivets to work loose. The sprocket teeth are cast in sections which are bolted to the drum. If thru some accident a tooth should be broken, it can be replaced in a few minutes' time at a very small cost. The mixing blades carry the material in a very rapid manner from the large charging opening toward the center of the drum, where it is carried upward by discharging buckets

and drawn back again into the mixing blades. The mixing operation is three-fold and insures a very rapid mix and an absolutely uniform quality of concrete in a few turns of the drum. The drum is supported on large chilled tracker rollers which are lubricated by means of compression grease cups.

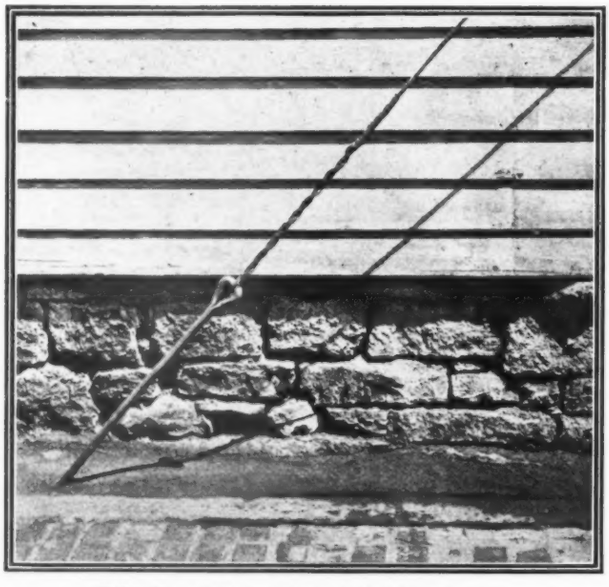
The Rex mixer is driven by riveted chain belt. The frame is constructed of heavy steel channels and thoroly braced. The road wheels on the Rex mixer are 28 inches in diameter, with a 6-inch face, to facilitate handling over rough roads. The Rex mixer is guaranteed for a period of one year against inherent defects in workmanship and material and the Chain Belt Company, Milwaukee, Wis., its maker, will replace any parts that are defective f. o. b. Milwaukee. The price of this machine without power loader and automatic water tank is $450 f. o. b. Milwaukee.

New Model Drive and Twist Anchors

The Gund Mfg. Co., La Crosse, Wis., are making their new type of drive and twist anchors of drop-forged steel. The sharp pear-shaped steel point will pierce roots, gravel, hard clay, etc., a blow from a sledge sending it down. A bar is then inserted in the eye and three revolutions to the right opens the blades or wings, thus securing a positive anchorage without resort to digging or tamping.



In crowded corners, alongside of buildings, pavements, etc., the drive and twist anchor is especially efficient. It requires but a small space for its installation and can be used where it would be absolutely impossible to set any other form of anchorage. A small hole can be broken thru pavement and the anchor driven thru, thereby saving much labor. The illustration shows an installation between a paved alley and a building. The space was only 3 inches wide.

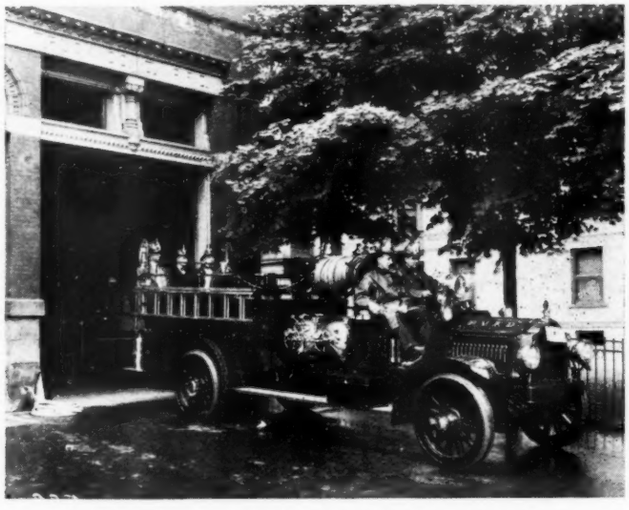


DRIVE AND TWIST ANCHOR *in use.*

New Worm-Drive Combination

The three-ton Packard combination chemical and hose wagon recently shipped the boro of Parnassus, Pa., is equipped with the Packard new worm drive. The worm, which is mounted above the worm wheel, and the worm wheel and differential, are mounted as a unit in a cast-steel carrier which is bolted in place in the center of the axle housing. The design permits quick and easy disassembling or assembling of the worm, worm wheel and differential, and their removal without taking the axle from under the truck. The lower part of the axle housing forms an oil reservoir of large capacity with an oil level and filler plug which automatically prevents over-filling. Provision is made for a constant lubrication of all bearings.

The service brake consists of two wire-woven, asbestos-lined, contracting shoes, operating on a drum at the rear of the transmission. Under normal conditions this brake will lock the rear wheels under a full load. The two emergency brakes are internal expanding segments, acting on pressed steel drums on the rear wheels and operated by a hand lever at the driver's left.



PACKARD *three-ton combination hose and chemical recently furnished boro of Parnassus, Pa.*

By the elimination of the motor governor this piece of apparatus is capable of a speed of twenty-five miles per hour.

The equipment includes two copper chemical tanks, 200 feet of ¾-inch chemical hose and reel, extension ladder, axes, door-openers, etc.

Heavy Duty Truck Tires

(Contributed.)

Speed and resiliency are the prime factors in public service truck tire equipment. To be fully efficient, tires for heavy duty service must be of a compound which is tough, dense and of extra wearing qualities, as well as resilient. They must be tough to withstand the strain of three-fold vibration; on their denseness depends their worth in withstanding the tearing, wearing strain of the road. Wear and resiliency, of course, must always be considered together.

Fig. 1 shows sections of a Goodyear demountable cushion tire possessing the following features: (1) Dual treads notched on the inside to give a greater gripping power to the road and increase the non-skid value of the tire; (2) slant-

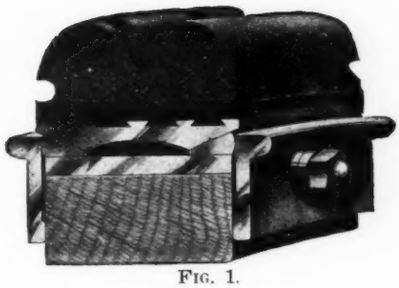


FIG. 1.

wise bridges acting as hinges allowing an easy distortion of the rubber so that it adapts itself to the inequalities of the road, permitting a natural displacement of the rubber where the tire is distorted; (3) pockets between the bridges providing space for the displaced rubber to go, so there are no spots of high and low compression, but it is evenly distributed thruout the tire; (4) steel base held in place on the wheel by wedge rings and flanges and can be applied or demounted with a wrench and a mallet.

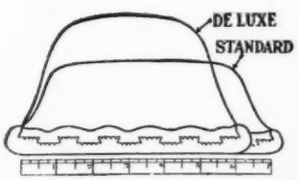


FIG. 2.

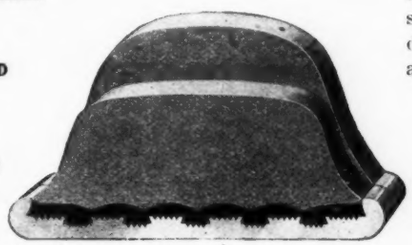


FIG. 3.

Fig. 2 and 3 represent a new type of Goodrich "De Luxe" tires, which is built higher than standard tires of the same width. This extra volume of tread rubber affords additional resiliency, which means a greater cushion for the truck and its load, and brings more wearing rubber between the road and the rim.

Tires of regular design, regardless of make, are but approximately 2.31 ins. high, whether their width is 3½ ins. or 7 ins. In the "De Luxe" the extra rubber is placed on top of the tread. Thus a 5-in. "De Luxe" has approximately as much rubber as a 6-in. regular. The duplex curve design of the "De Luxe" is an improvement over the European type made necessary by the severity of American operating conditions. The semi-circular shaped tread, the European design, when under load compresses so that the tread bulges out on either side. Bad roads chop off these edges, which hastens disintegration. The duplex curve tread, under load, assumes a shape similar to the European tread when not under load. This elimination of the bulge reduces chipping to the minimum and lengthens the tire life.

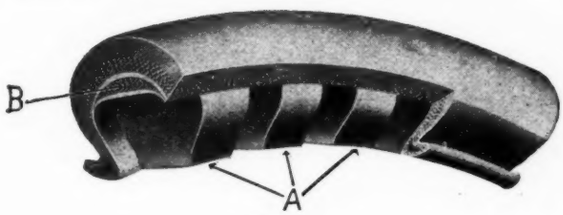


FIG. 4.

Figs. 4 and 5 are sectional views showing piers or columns of elastic rubber used in the construction of Dayton airless tires. These piers are molded inside the tire and are united to the casing and tread structure just as the piers of a cement

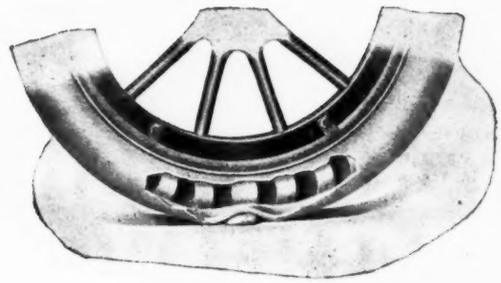


FIG. 5.

bridge are united to and form a part of the entire bridge structure. When on the wheel it looks exactly like and is the same size as a pneumatic. The difference between the two makes of tires is the interior supporting member. The pneumatic tire contains a rubber tube filled with compressed air, while the Dayton airless contains piers or columns of new elastic rubber and an annular rib (similar to a bridge construction), so constructed as to give sufficient strength to support any given weight of car, and yet deflect or "squeeze down" so as to absorb obstructions in the same manner as an air tube in a properly inflated pneumatic.

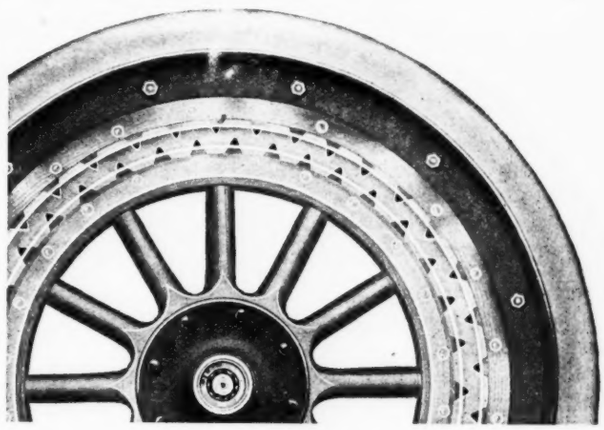


FIG. 6.

Fig. 6 shows side view of a Sewell cushion wheel, which is constructed with no connection between wood and wood, or wood and iron, except thru rubber, in this way avoiding any friction or wear. The yielding nature of the rubber cushion between the inner and outer felloes of the wheel furnishes sufficient resiliency to protect the vital parts, and greatly improves the riding qualities. Solid rubber tires mounted on Sewell cushion wheels give the required traction. The rubber cushion is protected by a side rubber flange or gasket on each side of the wheel, thus protecting it from dirt and grease. The absence of friction reduces the items of wear and tear to the minimum leaving only the laws of nature with which to contend as a factor in depreciation.

Trade Notes

The construction of two new buildings has been started at the plant of the Kissel Motor Car Co., Hartford, Wis., one for storage and shipping and one for the enameling department. The former is to be 100 feet long and the other 110 feet long, each being 35 feet in width. A third structure, soon to be started, is a modern four-story office building, which will house all of the executive and clerical forces of the company, including the cost and draughting departments. This will not only

The quality of sand is of late being given so much special consideration by engineers, architects, contractors, sand shippers and others interested in construction that a few weeks ago Mr. Cloyd M. Chapman and Mr. Nathan C. Johnson wrote a series of articles on "Sand" for the Engineering Record. These articles aroused so much interest that they have been reprinted, and Concrete Appliances Co., New York, is distributing them with a booklet descriptive of the universal sand tester.

provide much better accomodations and facilities for these departments, but will also release a large amount of floor space for manufacturing purposes.

The Barr Clay Co. of Streator, Ill., is the latest acquisition to the family of the Dunn Wire-Cut Brick Company's licensees. This is a company of the first importance in the middle West and its standing both as to business methods and quality of brick is of the very highest.

MacArthur Concrete Pile & Foundation Co. has been awarded contracts for the pile foundations of the office and three other buildings at the Willys-Overland Co. automobile plant in Toledo, O., and the foundation for a new chimney for the Locomobile Company of America, Bridgeport, Conn.

The McNichol Paving Co., Philadelphia, Pa., are laying 5,000 square yards of Durax granite blocks at Germantown avenue and Mermaid lane, the stone being furnished by the Harris Granite Quarries Co. of Salisbury, N. C.

The Metropolitan Paving Co. of New York, Hugo Reid, manager, is laying Durax granite blocks in the street intersections adjacent to the Miami hotel, in Dayton, O., where it can be inspected by those attending the convention of the American Society of Municipal Improvements, to be held in that hotel Oct. 11 to 15.

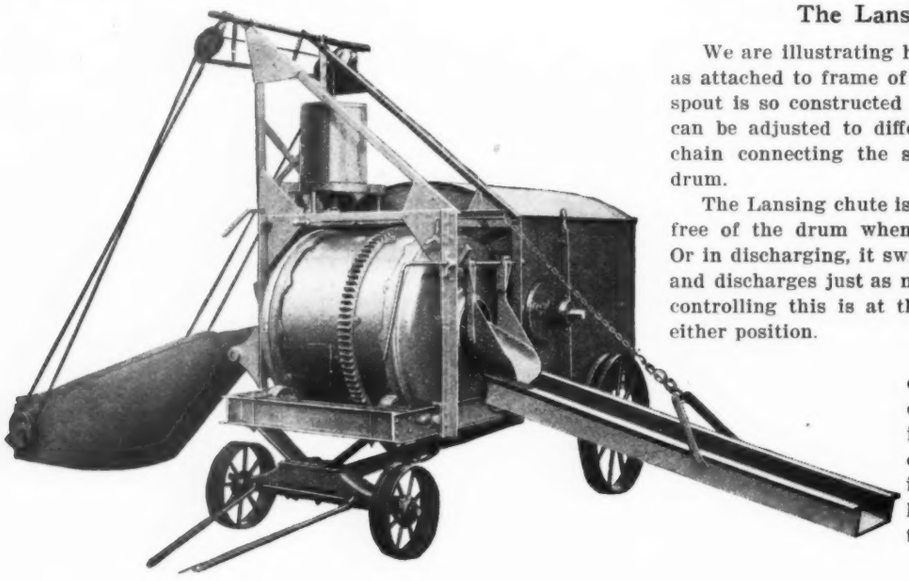
Serial No. 916 of The Studebaker Corporation, South Bend, Ind., is devoted to wagons for trucking and draying.

Burning crude oil is illustrated and the advantages of the De La Vergne oil engine are briefly and clearly stated in a handsome circular to be had of the De La Vergne Machine Co., 1175 East 138th street, New York.

The United States Asphalt Refining Co., issues a unique mailing booklet on "The Aztec Way."

P. Roughen, Fond du Lac, Wis., tells all about the Roughen adjustable paving gage for insuring correct crown and even surface in a fully illustrated booklet.

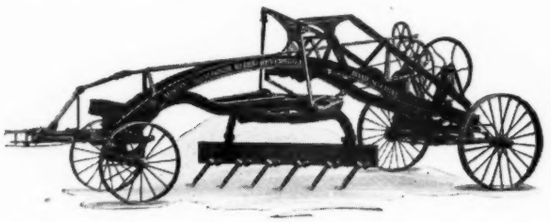
An unusual exhibit at the San Francisco exposition is described in a booklet on water tanks issued by the Pittsburg-Des Moines Steele Co.



The Austin Road-Ripper

The maintenance cost or upkeep expense of macadam, gravel, bitumen or dirt roads is an item that deserves special consideration. In many localities where some of the roads have been metaled or otherwise improved they have been allowed to deteriorate until the surface has raveled, ruts and ridges predominate and the conclusion has been forced on the minds of the taxpayers that the so-called "permanent roadway" is a poor investment.

Such a condition is not necessary and could be easily prevented if the proper maintenance equipment were provided. Any well-made hard road will last indefinitely if given proper attention at the right time. The Austin road-ripper is a massive scarifier attachment and is built for that purpose. It can



be attached to the Austin mammoth senior or junior grader after removing the regular mold board. It should not be confused with the Austin scarifier, which is a separate machine, propelled by the Austin motor roller.

When hauled by a traction engine of sufficient power, old, rutted and raveled roads with stone or gravel surface can be torn up to the depth required at the rate of from one-half to two miles of road per day. The teeth, or tines, are of special steel and will penetrate the hardest surface.

After the road has been thoroly scarified only a small amount of fresh metal is required, as the old metal has not been damaged and can be used in the new road. By substituting the regular blade for the scarifier attachment on the grader it can be used to crown the road and properly level the new material, when the road is ready again to be rolled into shape. The cost of rebuilding old, worn-out roads in this way is very moderate.

The photograph shows the machine ready for operation. Detailed information about it can be obtained from the Austin-Western Road Machinery Co., Chicago, Ill.

The Lansing Spout Attachment

We are illustrating herewith an 8-ft. spout with high sides as attached to frame of Lansing concrete batch mixers. This spout is so constructed as to discharge at various angles and can be adjusted to different heights or slant by means of a chain connecting the spout with the frame work over the drum.

The Lansing chute is a crescent shaped spout which swings free of the drum when mixing and leaves it entirely clear. Or in discharging, it swings into the machine at a short angle and discharges just as much or as little as desired. The lever controlling this is at the front of the machine and locks in either position.

The automatic water tank is made of heavy galvanized steel. The amount of water desired is regulated by a float inside of the water tank. This float can be set by the contractor according to the consistency of the batch he desires. By raising the float the flow of water is increased, and by low-

ering, decreased. When the desired flow of water is secured, the float can be set and there will be no other adjustments necessary until the contractor wishes to change the consistency of his batch. The construction of the water tank is very simple, consisting of the float, one check valve, one three-way plug valve, and one hand lever by which it is operated.

Boston's Versatile Truck

A Peerless truck, operated by the city of Boston, is equipped with a 900-gallon steel tank and it is used interchangeably as a road oiler or a street sprinkler. Pressure is maintained in the tank for either purpose with a rotary pressure pump.

AS A STREET SPRINKLER.

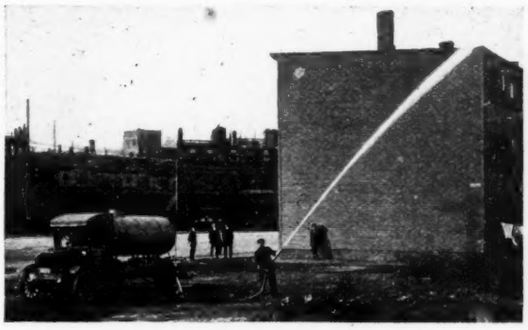
It is the usual plan to use the truck as a sprinkler on the paved streets on Sundays when the roads and boulevards are in active use. When used as a sprinkler the truck travels 12 miles per hour and does the entire work on routes that formerly were covered by three watering carts.

AS A ROAD OILER.

When it is used as a road oiler the average speed of the truck is 8 miles per hour and it covers 12,500 square yards with a tank full of oil in 18 minutes. The oil is sprayed thru No. 40 nozzles at a pressure of 40 pounds. While it is not possible to maintain this speed constantly, the foreman states that the truck takes the place of six horses and two drivers.

By means of a three-way valve the rotary pump may be used to pump the oil used on the roads out of an oil car at the siding, thus doing away with the necessity of using a hand pump.

AS A GARBAGE TRUCK.



AS A FIRE ENGINE.

This rotary pump also supplies enough pressure to enable the truck when filled with water to be used as a fire extinguisher for dump pile fires or for any fire which is so far from a water hydrant that the regular apparatus has difficulty in getting into operation.

The tank is replaced with a dumping body of large capacity and the truck is also used for the collection of garbage and ashes.

High-Pressure Fire Service Systems in Operation

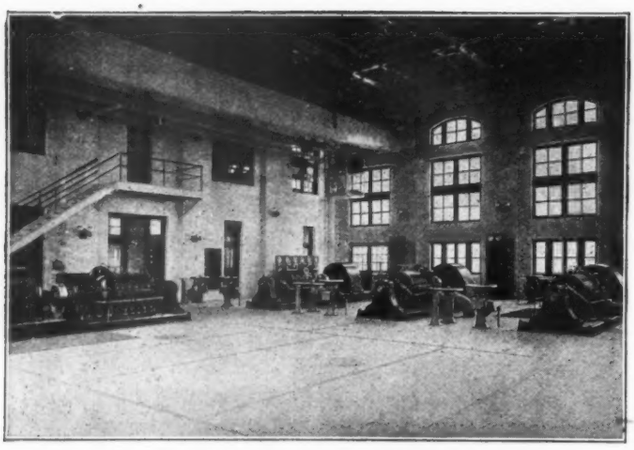
The Allis-Chalmers Company installed one of the first high-pressure fire service pumping station of any consequence in this country using motor driven centrifugal pumps. These pumps were installed in two stations in New York, the order being placed in 1906. There were ten 10-inch, 6-stage pumps, each having a capacity of 3,000 gallons per minute against a total head of 700 feet. Each pump was direct connected to an 800-horse power Allis-Chalmers induction motor mounted on the same base with the pump and direct coupled to the pump. These fire pumps were very thoroly tested, full reports of the test having been published very generally.

Later two additional pumps of the same type and capacity were furnished the city of New York so that they now have in service 12 high-pressure fire pumps built by this company.

The city of Jacksonville, Fla., has Allis-Chalmers high-pressure fire service pumping equipment, consisting of two 2,500-gallon-per-minute, 414-foot head pumps, direct connected to 375-h.p., 1,130-r.p.m. motors. The pumps are 10-inch, 4-stage pumps and were ordered in 1909.

In the same year the city of Spokane, Wash., ordered six motor-driven centrifugal pumps and motors and an additional unit in 1910. These pumping units consist of 14-inch, 2-stage pumps, one pump connected to each end of a single 900-h.p., 860-r.p.m. induction motor. These pumps operate in parallel against domestic pressure and in series to deliver 5,200 gallons per minute against 430 feet for fire service.

In 1912 the city of Cleveland ordered a complete high-pressure fire service pumping equipment from the Allis-Chalmers Company consisting of pumps, motors and switchboard. In this station the equipment is of the most up-to-date design and the details have been worked out along lines which embody the results of this company's considerable experience in building this class of apparatus. In the Cleveland station there are four 10-inch, 5-stage pumping units, each having a capacity of 2,500 gallons against a head of 555 feet; the motors



are 550-h. p., 1,160-r. p. m. induction motors. The accompanying photograph shows the operating floor of the Cleveland station, with the four electrically-driven pumps, switchboard, control boards and central meters. There is space to the right for two more pumps.

The most recent order the company has received for motor-driven centrifugal fire pumps was received this year from the Arow Engineering Company for Allis-Chalmers pumps, motors and switchboard to go in the Toledo high pressure fire service station. There are four pumping units consisting of a 10-inch, 5-stage pump direct connected to a 550-h. p., 1,450-r. p. m. induction motor. The pumps will deliver 2,000 gallons per minute against a total head of 700 feet.

The Allis-Chalmers Company, Milwaukee, Wis., publish full official descriptions and reports of tests of the high pressure fire service systems installed in New York in 1906, and in Cleveland in 1912, which are worthy of careful study. They will be sent by the company on request.

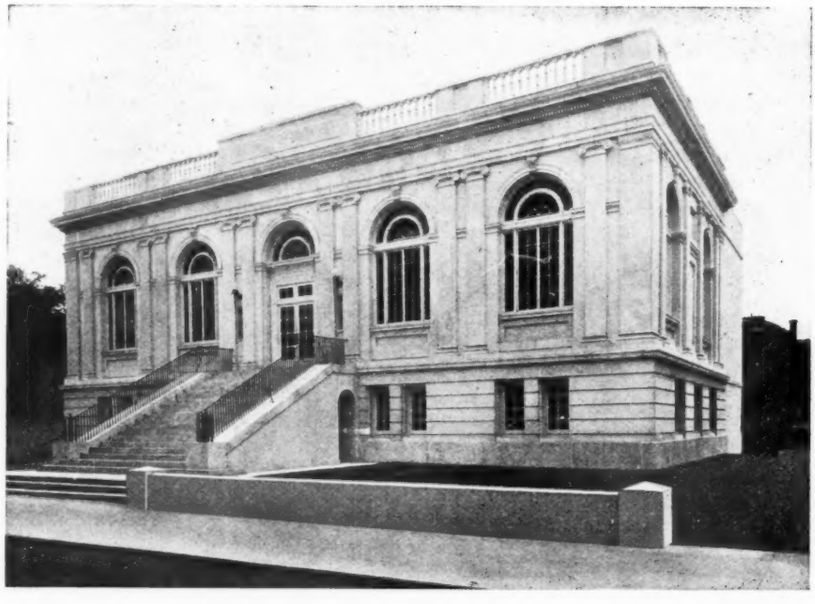
Library Building of the Charleston, S. C., Library Society

The Charleston Library, considered by competent judges the most valuable in proportion to its size in the United States, was founded in 1748, and the Charleston Library Society, despite losses thru fire, has preserved books which cannot be replaced. The collection consists of 42,000 volumes and 10,000 pamphlets, among which are manuscripts relating to Huguenots; autograph letters and documents of historical significance; Indian treaties; Audubon's Birds; Piranesi's Antiquities of Rome; rare works on architecture, archæology and natural science; a large collection of historical pamphlets and Caroliniana; files of the South Carolina Gazette and its successors, from 1732 to date; files of the other Charleston papers, including the Mercury. These files are bound in 475 volumes, some of unusual size, and contain original historical material nowhere duplicated.

McGoodwin & Hawley, Philadelphia, were the architects, and in designing this building it was their idea to reproduce something of the character of the Italian Renaissance palaces, with carved stone cornices and moldings on broad plaster surfaces. Mat-glazed terra cotta was used instead of stone for the cornices, molding, etc., and the final coat of plaster was composed of ground white marble and Medusa White Portland cement, smoothly finished in a very satisfactory manner.

The building is a fireproof structure, with extremely heavy walls for a building of this type, the object being to protect the valuable books and papers. The Melton Construction Company, Washington, D. C., were the general contractors who personally had charge of the cement work and plastering, and did not sublet this phase of the work on account of the very exacting specification requirements.

Walker & Burden, Charleston, were the supervising architects and engineers.



Standard Rating of Batch Concrete Mixers

Up to the present time there has never been any standard method of rating batch mixers. Some mixer manufacturers rate their machines by their capacity in mixed concrete, while other manufacturers rate them by their capacity in loose unmixed material. It is a well-known fact that a mixer having a batch capacity of 8 to 9 cubic feet of unmixed sand, stone and cement will hold only about 6 cubic feet of mixed concrete per batch. For this reason the term three, four or nine-foot mixer has never had any real, definite significance.

The National Association of Mixer Manufacturers, at their August meeting, took steps toward remedying this difficulty by adopting a resolution providing for the uniform rating of batch mixers. This resolution provides that the members of the association in future catalogs and circulars shall specify the capacity of their mixers as "size of wet-mixed batch," and not otherwise. The resolution further provides that the dry unmixed capacity of a mixer may be approximated as one and one-half (1½) times the wet-mixed batch, assuming the use of cement, sand and one and one-half (1½) inch crushed stone, with 1¾ gallons of water per cubic foot of mixed concrete. The members of the association further agreed not to use the dry-batch rating in their correspondence, advertising, etc., unless the standard wet-batch rating were used also and with equal prominence.

This step is a very desirable one that will prove beneficial to all contractors, mixer manufacturers, and everyone in fact connected with the concrete and cement industry. A contractor can now arrive at a real comparison between mixers, not only in price but also in capacity. This would have been much more difficult without a standard rating.